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Issued January 20, 1909.

U. S. DEPARTMENT OF AGRICULTURE.

TWENTY-FOURTH ANNUAL REPORT

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OF THE

BUREAU OF ANIMAL INDUSTRY

FOR THE YEAR

1907.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1909.

[STATUTES AT LARGE, VOL. 28 (CHAP. 23), P. 601.]

AN ACT Providing for the public printing and binding and the distribution of public documents.

SEC. 73. Extra copies of documents and reports shall be printed promptly when the same shall be ready for publication, and shall be bound in paper or cloth as directed by the Joint Committee on Printing, and shall be the number following in addition to the usual number:

Of the report of the Bureau of Animal Industry, 30,000 copies, of which 7,000 shall be for the Senate, 14,000 for the House, and 9,000 for distribution by the Agricultural Department.

Approved, January 12, 1895.

737859

LETTER OF TRANSMITTAL.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., July 14, 1908.

SIR: I have the honor to transmit herewith the Twenty-fourth Annual Report of the Bureau of Animal Industry for the year 1907, and recommend that it be published, as provided by section 73 of the act of Congress approved January 12, 1895.

Respectfully,

A. D. MELVIN,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

ORGANIZATION OF THE BUREAU OF ANIMAL INDUSTRY.

Chief: A. D. MELVIN.
Assistant Chief: A. M. FARRINGTON.
Chief Clerk: CHARLES C. CARROLL.
Biochemic Division: M. DORSET, chief; JAMES A. EMERY, assistant chief.
Dairy Division: ED. H. WEBSTER, chief; C. B. LANE, assistant chief.
Inspection Division: RICE P. STEDDOM, chief; MORRIS WOODEN, R. A. RAMSAY, and ALBERT E. BEHNKE, associate chiefs.
Pathological Division: JOHN R. MOHLER, chief; HENRY J. WASHBURN, assistant chief.
Quarantine Division: RICHARD W. HICKMAN, chief.
Division of Zoology: B. H. RANSOM, chief.
Experiment Station: E. C. SCHROEDER, superintendent; W. E. COTTON, assistant.
Animal Husbandman: GEORGE M. ROMMEL.
Editor: JAMES M. PICKENS.

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TWENTY-FOURTH ANNUAL REPORT OF THE BUREAU OF ANIMAL INDUSTRY.

REPORT OF THE CHIEF OF THE BUREAU FOR THE FISCAL YEAR ENDED JUNE 30, 1907.

By A. D. MELVIN.

GROWTH DURING THE YEAR.

The fiscal year ended June 30, 1907, witnessed an unprecedented increase in the work of this Bureau. This was due mainly to the extension of the meat inspection under the new law of June 30, 1906, and partly to the work of eradicating the southern cattle tick, which was begun in the summer of 1906. The large and rapid growth during the year is well shown by the increase in the number of employees and in the expenditures for the maintenance of the work. Both of these items were more than doubled, the Bureau force having grown from 1,460 on July 1, 1906, to 3,152 a year later, while the expenditures rose from $1,510,868.20 for the fiscal year 1906 to $3,111,528.62 for the fiscal year 1907.

The following statement presents a comparison of the number of employees on the rolls of the Bureau, classified by lines of work, at the beginning and end of the fiscal year:

Force employed in the Bureau of Animal Industry in 1906 and 1907.

Class of work.	Number of employees—	
	July 1, 1906.	July 1, 1907.
Administration	43	78
Meat inspection	981	2,290
Inspection of animals for export	26	24
Inspection and quarantine of imported animals	30	26
Control and eradication of contagious diseases of animals	236	548
Scientific investigations concerning animal diseases	83	105
Dairy investigations and inspection of dairy products	40	51
Animal husbandry investigations	21	30
Total	1,460	3,152

The expenditures for the various lines of work for the fiscal year 1907 are shown in the following statement, which includes accounts approved for payment up to August 28, 1907:

Expenditures of the Bureau of Animal Industry for the fiscal year 1907.

General administrative work	$82,805.00
Meat inspection (including inspection of animals for export)	2,159,474.12
Sheep scabies eradication	244,249.30
Cattle scabies eradication	88,689.34
Inspection of southern cattle	36,095.90
Eradication of southern cattle ticks	169,503.86
Supervision of transportation of live stock and inspection of vessels	35,084.85
Inspection and quarantine of imported animals	31,525.98
Inspection work relative to contagious diseases, testing animals with mallein and tuberculin, etc	8,485.22
Scientific investigations concerning diseases of animals	123,705.57
Dairy investigations	78,094.78
Inspection of renovated butter factories and markets	15,637.96
Animal husbandry investigations	38,176.74
Total	3,111,528.62

MEAT INSPECTION UNDER THE NEW LAW.

It is seen from the above statement that only $2,159,474.12 was expended for meat inspection out of the appropriation of $3,000,000 made by Congress for this purpose, but it should be remembered that the law was in full force but nine months of the fiscal year and that the service was constantly expanding during the year. The rate of expenditure during the first half of the period was considerably below the normal requirements under the new law.

The operation of the new law has, on the whole, been satisfactory and has shown the wisdom of that measure. This law has overcome several defects of the old law and has enabled the Bureau not only to extend the inspection, but to improve its efficiency. The important matters of sanitation of slaughtering and packing establishments, preparation of meats and products, use of chemicals, preservatives, etc., and prevention of fraudulent labeling are now controlled and regulated, whereas formerly the Bureau had no authority over them, but was practically confined to an inspection before and at the time of slaughter to determine the health of the animals. The interstate transportation of meats and meat food products is also now under control. The Federal meat inspection is on a higher plane than ever before, and public confidence, which was unsettled by the agitation of the previous year, has been restored.

The Department's regulations governing the meat inspection are based upon scientific knowledge and principles and upon the experience of many years. Regulations under the new law were issued under date of July 25, 1906, and additional regulations, amendments, and rulings were issued later as circumstances required and as the work developed.

In meat inspection it is sometimes difficult to determine how to dispose of carcasses affected in some degree with abnormal conditions—in other words, to decide just where to draw the line between what should be condemned and what passed. The regulations are made as explicit as possible, and yet much must be left to the judgment of the inspectors. Most animals are in such a good state of health that there is no question as to the wholesomeness of their meat, while others may be so diseased as to leave no doubt that their carcasses should be condemned. But at some point between these two extremes there arises a question as to whether a carcass or part should be passed or condemned. Sometimes an affection is so slight and so localized as not to impair the wholesomeness of the meat, and by removing an organ or cutting away a small portion of the carcass the remainder may be safely passed. The public should be protected against diseased and unwholesome meat, yet good meat should not be needlessly destroyed. In questions of this sort the Department has endeavored to be on the safe side, and its regulations and practice in this respect are more strict than those of European countries.

The Secretary of Agriculture, deeming it wise to have the benefit of the opinions and advice of a commission of experts outside of the Department with regard to these matters, appointed such a commission early in the year 1907, to consider and advise relative to those portions of the Department's meat-inspection regulations relating to the disposition of carcasses affected with various diseases and abnormal conditions. The membership was as follows: Dr. William H. Welch, professor of pathology, Johns Hopkins University, chairman; Dr. L. Hektoen, professor of pathology, University of Chicago; Dr. M. J. Rosenau, director of the hygienic laboratory, United States Public Health and Marine-Hospital Service; Dr. Joseph Hughes, president of the Chicago Veterinary College; Dr. V. A. Moore, professor of comparative pathology, Cornell University; Dr. Leonard Pearson, dean of the veterinary department of the University of Pennsylvania, and Dr. Charles Wardell Stiles, chief of the division of zoology, hygienic laboratory, United States Public Health and Marine-Hospital Service, secretary.

This commission held sessions in Washington during February, and under date of July 29 submitted a report. The general conclusions reached are stated in the following words: "If there be any general error in the regulation this is in favor of the public rather than in favor of the butchers and packers."

The specific suggestions made by the commission are being considered in the preparation of revised regulations.

A change in the method of marking fresh meats with the inspection legend has been adopted by which a saving estimated at between

$400,000 and $500,000 a year on the cost of the label previously used is being effected. The new method consists in the use of a metal stamp with special ink prepared by the Bureau.

NEED FOR LOCAL INSPECTION.

The more rigorous and efficient the inspection, however, the greater becomes the danger from uninspected meats, as the tendency of a strict inspection is to cause diseased animals to be sent to slaughter-houses having no inspection. The Federal inspection can and does insure the wholesomeness of the product of establishments doing an interstate and export business, but there the Federal power ends. The Government can not reach the numerous small local establishments whose product is sold entirely within a State. Some of the worst conditions have been found at places of this kind. Here arises the necessity for the Federal inspection to be supplemented by State and municipal inspection, if the public is to be fully protected. Pennsylvania has commenced what appears to be an efficient meat-inspection system. Similar measures are being considered in other States, and several cities have municipal inspection of varying degrees of efficiency.

In some places the local inspection consists merely of an examination of meat as displayed for sale in the market and the condemnation of any that may be tainted or spoiled. Such inspection is of very little benefit to the public, as the average purchaser is able to determine when meat is tainted. What is of much greater importance is to protect the public where it can not protect itself—by excluding diseased meat from consumption, and especially meat from animals affected with diseases communicable to man. In many cases an animal may be diseased without this being apparent in the dressed carcass. It is therefore essential that there should be a careful inspection of the animals by competent veterinarians at the time of slaughter. No inspection system which omits this feature can be considered efficient. In order to carry on municipal inspection in a practical way there should be central abattoirs, either private or municipal, at which all slaughtering should be concentrated. With such abattoirs the sanitation could be better controlled and the inspection carried on systematically and with a smaller force than where the work is scattered.

In the absence of adequate local inspection the consumer can still be assured of wholesome meats by insisting on having none but those bearing the Government stamp, providing the purchaser uses reasonable judgment in selecting meats which have not spoiled since the time of inspection.

SUSPENSION OF MICROSCOPIC INSPECTION.

As the microscopic inspection of pork for trichinæ has been discontinued, perhaps the reasons for this action should be made plain. This inspection was inaugurated in 1892 to meet the requirements of Germany and other countries which forbade the importation of American pork unless it had been microscopically inspected. This inspection was applied, however, only to pork intended for export to such countries. Experience has shown that under practical conditions a reliable inspection for trichinæ is not possible. In numerous instances trichinous pork has been examined as many as twenty or thirty times before the parasites were found, and in practice it is out of the question to make so many examinations. The failure of microscopic inspection to exclude trichinous pork has been fully demonstrated by the experience of Germany, where a very elaborate system is in operation, with a force of inspectors variously estimated at 25,000 to 100,000, and where, nevertheless, many cases of trichinosis have occurred from eating inspected pork. It was found that some foreign governments, although requiring certificates of microscopic inspection by the United States Government, paid no attention to these certificates, but made an additional inspection of their own, on the result of which depended the admission of the products. In view, therefore, of the expense and the ineffectiveness of the microscopic inspection it was decided to stop it.

This microscopic inspection for trichinæ has never been carried on or considered necessary for the protection of the American public. The danger of contracting trichinosis comes from eating pork in a raw, uncured state, and this is not the custom among the people of this country. The trichina parasites are destroyed by thorough cooking or curing. Consumers should understand that the Government mark "Inspected and passed" does not guarantee that the meat has been inspected for trichinæ. In all cases, whether pork has been inspected or not, it should be thoroughly cooked or thoroughly cured before it is used for food.

Cases of trichinosis have occurred in this country, and it is suggested that in communities where the habit exists of eating raw or underdone pork the local officials of such communities either try to discontinue this habit or establish inspection stations where such meat can be brought for examination, for although it is not believed that the inspection will eliminate all cases of trichinosis, the disease may be reduced to a minimum.

IMPROVEMENT OF THE MILK SUPPLY.

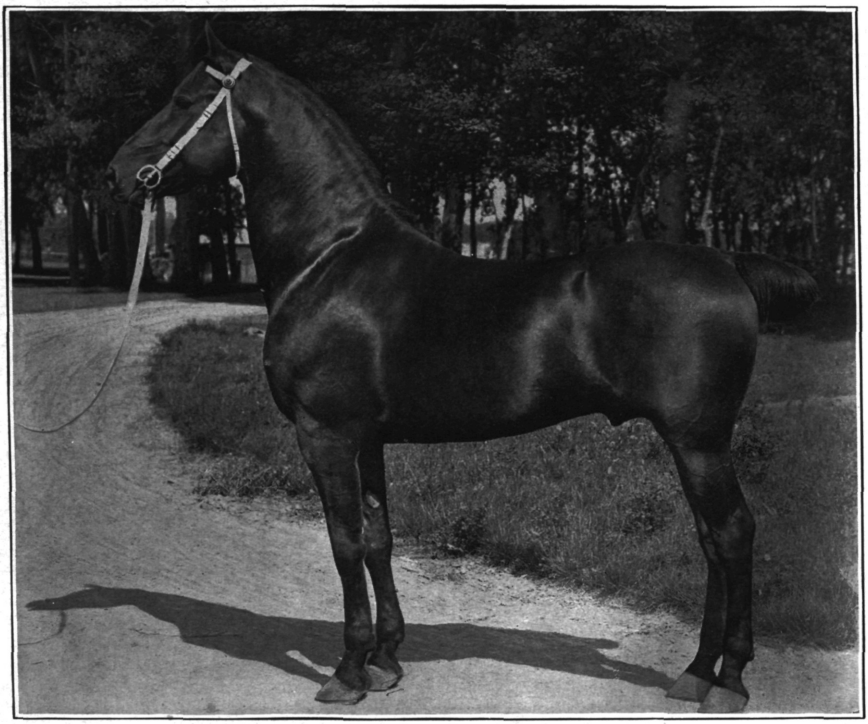
In the general movement for wholesome food a matter of great importance is a sanitary milk supply. Milk is more generally and extensively used as food than any article except bread. Because of

its liquid state it is particularly susceptible to contamination, and as it is usually consumed raw it becomes especially dangerous when disease germs gain entrance into it. The subject of improving the milk supply has recently received considerable attention from health officers and from the public.

The Bureau, through its Dairy, Biochemic, and Pathological divisions, has made a special investigation of the milk supply of the city of Washington, in cooperation with the District authorities, with the result that very unsatisfactory conditions have been disclosed. A large proportion of dairy cows were found affected with tuberculosis, and the sanitary conditions in many dairies were very bad. The average rating of all dairies supplying milk to the city was but 45.03 points, according to a score card arranged by the Dairy Division, 100 representing perfect. It is believed that these conditions are better rather than worse than those existing with regard to the milk supply of most other large cities. Butter and cheese, besides milk, are liable to be affected by insanitary conditions.

This is more than a local problem. It affects the welfare of the country at large, and much of the milk and other dairy products enter interstate commerce. It therefore seems important that the subject should be taken up by the Federal Government. The work being done under the meat-inspection law should be supplemented by measures to protect the public from disease-carrying and unwholesome dairy products. It is not enough to inspect such products after they are prepared. The stream must be purified at its source. The health of the cows must be examined into, and sanitary conditions must be enforced in the production, handling, and preparation of the products. There are several lines of procedure by which the Federal Government can contribute to the betterment of the supply of dairy products. Some of these are to make a comprehensive investigation of sanitary conditions at dairy establishments and of the health of dairy cows throughout the country, placing the information before local authorities and cooperating with them to remedy bad conditions; to require that all dairy products transported interstate or exported shall have come from healthy cows and have been produced and handled under sanitary conditions; to examine and test cows and to enforce sanitation in all dairy establishments the products of which enter interstate or foreign commerce, and to make the tuberculin test of dairy cows in any other cases where this is required or requested. Inspected products or the products of inspected and approved dairies should be marked for identification, as in the meat-inspection service.

In view of the position taken by Congress in passing the meat-inspection law it would seem all the more logical for that body to



CARMON 32917, AT 12 YEARS OF AGE.

Standardbred carriage stallion, shown as "Glorious Thundercloud." At the head of the Government stud at the Colorado Experiment Station since 1905.

pass a law giving specific authority for the inspection of all dairy cows and dairy establishments whose products are to enter interstate or export trade, in order that the products of diseased cows may be excluded.

From investigations so far made it appears that the conditions surrounding the production of milk and other dairy products, with regard to disease and sanitation, are fully as great a menace to the public health as were the reported conditions in the meat industry which prompted the passage of the meat-inspection law. It is therefore recommended that Congress be asked to grant the authority suggested and to appropriate the necessary funds. With the present organization and facilities of the Bureau the additional expenditure required for such inspection service would probably not be very large. There would arise, however, the question of the disposal of the animals found diseased. The safest method would be to slaughter such animals, and this would mean a heavy loss to the owners unless some means of indemnity should be provided. It seems only fair that if animals are slaughtered in the interest of the public health the public should bear at least a portion of the loss, and if Congress and State legislatures take this view some provision should be made for funds with which to compensate owners of condemned animals.

TICK ERADICATION.

Encouraging progress has been made in the eradication of cattle ticks from the Southern States. This work, which was begun in the summer of 1906 under an appropriation by Congress of $82,500 "to enable the Secretary of Agriculture to undertake experimental work in cooperation with State authorities in eradicating the ticks transmitting southern cattle fever," is no longer an experiment. The results already accomplished demonstrate that the extermination of this costly pest is not only possible but practicable, though several years may be required for the completion of the work. From January 1 to October 31, 1907, there were released from quarantine, or prepared for release in the near future, areas aggregating over 40,000 square miles. This means that the cattle of an area almost as large as the State of Tennessee are, for the first time in years, to have an unrestricted market.

While for the most part the State authorities have cooperated, it is unfortunate that in some sections the Bureau's work has met with a lack of support and even with active opposition, this condition probably being due to a failure to realize the benefits to follow from the work. It therefore seems best not to resume operations in such localities until public sentiment changes, as more can be accomplished by using the available funds in sections where the work is appreciated and supported by those most directly interested.

Congress appropriated $150,000 for the work of tick eradication during the fiscal year 1907–8, but still larger amounts must be provided if it is to be prosecuted on a sufficiently large scale to bring success within a reasonable time, and it is recommended that Congress be asked to grant an increased sum for this work. Judging the requirements by the work of 1907, and looking to the needs of the immediate future, it is believed that $50,000 additional should be made available for the remainder of the fiscal year 1908 and that $250,000 could be advantageously and judiciously expended during the fiscal year 1908–9. The great benefit which will accrue to the cattle industry of the South and incidentally to the country at large from the success of this work will abundantly justify the necessary expense.

TRANSPORTATION OF LIVE STOCK.

Inspectors of the Bureau stationed at the principal live-stock centers have been required to report all cases where live stock have been confined in cars without feed or water in excess of the limit provided by law. These reported violations have been referred to the Department Solicitor, and, where the evidence of the violation has appeared sufficient, prosecution has been recommended.

While the new law has been much better observed than the old one was, many violations still occur. However, the cruelty to the animals could be much further reduced by requiring a minimum rate of speed at which they shall be carried.

SCABIES ERADICATION RETARDED BY REMOVAL OF FENCES.

Good progress was made during the fiscal year toward eradicating sheep scab in the West, but the eradication of scabies of cattle has been greatly retarded in some localities by the removal of fences from the public domain in conformity with an act of Congress.

Most stock owners are not only willing but anxious to assist in freeing their cattle of disease, but a small minority are not, and where cattle mingle as they do upon the open range, without any restriction, it is very difficult to enforce proper sanitary measures. It is highly important, in the eradication of disease, for stock owners to have some control over the lands occupied by their animals, and in this respect the enforced removal of fences has been a great disadvantage. It would be of great assistance in combating contagious diseases of live stock if the public land laws were so amended as to permit the leasing and fencing of the public domain. Fortunately, scabies or mange is a comparatively mild disease. If some plague such as rinderpest, foot-and-mouth disease, or contagious pleuro-pneumonia should be introduced, the losses under the conditions following the

removal of fences would be beyond estimate and would in some localities amount to extermination of the live stock.

It became clearly apparent during the year that the regulations in force were inadequate for eradicating cattle scabies under range conditions, especially in sections affected by the removal of fences, and that more stringent measures were required if any substantial headway was to be made. New regulations were accordingly put into effect after careful consideration of the situation, and better results are expected. The Bureau has endeavored to suppress this disease without any greater hardship to cattle owners than is necessary, but recent conditions have demanded more rigorous measures than were previously applied, and while some inconvenience may be caused for a time, it is believed that unless measures fully as strict as the present regulations are enforced the Department might as well abandon all efforts to eradicate the disease. There is no doubt that the ultimate results will fully justify the temporary inconvenience.

NEED FOR ANOTHER EXPERIMENTAL FARM.

The need for an experimental farm near Washington for breeding, feeding, and dairy investigations, as pointed out in the previous year's report, is becoming more and more apparent. Work of this character should obviously be kept separate from that carried on at the present experiment station for contagious diseases. It is hoped that Congress may be willing to provide for the purchase of a separate farm for investigations in breeding and feeding live stock and in dairying.

ORGANIZATION.

The organization of the Bureau remains practically the same as shown in the previous report. The work carried on during the fiscal year in the various branches of the Bureau is set forth in the following pages, which are based on reports made by the respective heads of those branches to the Chief of the Bureau.

WORK OF THE INSPECTION DIVISION.

The work of the Inspection Division, in charge of Dr. R. P. Steddom, chief, consists of two main lines—(1) the meat inspection and (2) the field work for the control and eradication of contagious diseases of animals. The latter comprises the inspection of southern cattle and the supervision of their movement when forwarded from the area quarantined on account of Texas or tick fever, the work for the extermination of the southern cattle tick which spreads this disease, and the work for the eradication of scabies of sheep and cattle in the West.

THE MEAT INSPECTION.

The new meat-inspection law approved June 30, 1906, and effective October 1, 1906, which made mandatory the "post-mortem examination and inspection of the carcasses and parts thereof of all cattle, sheep, swine, and goats to be prepared for human consumption * * * for transportation or sale as articles of interstate or foreign commerce," has resulted in the extension of the work of this division to a very largely increased number of establishments; this, together with the provisions of the same law requiring the supervision of the processes of preparation of meats and meat food products prepared in such establishments, and the reexamination of such meats and products, have made necessary a force of employees which at the close of the fiscal year was more than double the number required at any previous time in the history of the Bureau.

NUMBER OF ESTABLISHMENTS AND CITIES.

The following table shows the number of establishments and the number of cities and towns where the inspection of meats and meat food products was conducted in each fiscal year since 1891. The figures relating to 1907 show an increase of 334.4 per cent in the number of establishments and of 220.7 per cent in the number of cities and towns, as compared with the previous fiscal year.

Number of establishments and cities where meat inspection has been conducted, fiscal years 1891 to 1907.

Year.	Establishments.	Cities and towns.	Year.	Establishments.	Cities and towns.
1891	9	6	1900	149	46
1892	23	12	1901	157	52
1893	37	16	1902	155	50
1894	46	17	1903	156	50
1895	55	19	1904	152	51
1896	102	26	1905	151	52
1897	128	33	1906	163	58
1898	135	35	1907	708	186
1899	139	42			

MARKET INSPECTION.

Inspection is maintained at 29 markets as a matter of convenience to dealers who handle meats issuing from establishments having inspection, and who in supplying their customers find it necessary to ship orders into another State. The volume of this business is so small that no separate record has been kept of it, the stamps, seals, etc., used in identifying such consignments being included in the regular establishment records.

EXEMPTION FROM INSPECTION.

The present meat-inspection law provides that it shall not apply to animals slaughtered by any farmer on the farm nor to retail butch-

ers and retail dealers in meat and meat food products supplying their customers. Based upon this provision of the law, the regulations of the Department provided for the granting of formal certificates of exemption to retail butchers or retail dealers engaged in supplying their customers through the medium of interstate or foreign commerce, and required that all meats and meat-food products shipped under such certificates be formally certified by the shipper as sound, healthful, wholesome, and fit for human food. Compilations made from these shippers' certificates indicate that in round numbers the shipments made thereunder to June 30, 1907, approximate twenty million pounds.

A great many certificates of exemption granted in the fall of 1906, when it was impossible to make a thorough investigation of the establishments, have since been canceled because upon inspection the establishments were found to be insanitary; certificates have been withheld in other cases for the same reason, either permanently or until the places were put in sanitary condition; and it was found upon investigation that certificates were held in some cases by establishments that should operate under inspection, and these certificates were accordingly withdrawn and inspection established. In all there were outstanding at the close of the fiscal year 1907 about 4,000 certificates of exemption.

ANTE-MORTEM INSPECTION.

Since October 1, 1906, the regular ante-mortem inspection at slaughtering centers has been confined to animals that were about to be slaughtered, while those that were not to be slaughtered at local establishments were inspected for contagious diseases only. In view of this change the column heretofore appearing in the table showing ante-mortem inspections, under the heading "For other cities and miscellaneous buyers," is not included in the following statement, although such inspections were made during the first quarter of the fiscal year, as follows: Cattle, 1,457,749; calves, 207,309; sheep, 1,870,755; swine, 2,616,480; total, 6,152,293.

Ante-mortem inspections of animals about to be slaughtered, fiscal year 1907.

Kind of animals.	Passed.	Suspected.[a]	Total.
Cattle	7,606,653	25,445	7,632,098
Calves	1,760,203	3,382	1,763,585
Sheep	9,723,016	1,295	9,724,311
Swine	31,797,790	25,709	31,823,499
Goats	55,540	1	55,541
Total	50,943,202	55,832	50,999,034

[a] This term is used to designate animals found diseased or suspected of being diseased on ante-mortem inspection, most of which are afterwards slaughtered under special supervision, the final disposition being determined on post-mortem inspection.

The foregoing table shows an increase of 20.5 per cent over the ante-mortem inspections made for official establishments during the previous fiscal year.

POST-MORTEM INSPECTIONS.

The following table shows the number of inspections made at time of slaughter, an increase of 18.7 per cent over the previous year:

Post-mortem inspections, fiscal year 1907.

Kind of animal.	Passed for food.	Passed for lard and tallow only.	Condemned.	Total.
Cattle	7,593,220	564	27,933	7,621,717
Calves	1,757,112	48	6,414	1,763,574
Sheep	9,672,200	152	9,524	9,681,876
Swine	31,639,620	70,401	105,879	31,815,900
Goats	52,106	1	42	52,149
Total	50,714,258	71,166	149,792	50,935,216

Included in the foregoing table are the post-mortem inspections of animals rejected or suspected on ante-mortem inspection, and the final inspection of carcasses that were retained [a] for disease or other cause at time of slaughter.

The various diseases and conditions for which carcasses and parts were condemned and tanked are shown in the following table:

Diseases and conditions for which condemnations were made on post-mortem inspection, fiscal year 1907.

Cause of condemnation.	Cattle.		Calves.		Sheep.		Swine.		Goats.
	Carcasses.	Parts.	Carcasses.	Parts.	Carcasses.	Parts.	Carcasses.	Parts.	Carcasses.
Tuberculosis	19,305	10,530	68	4	.....	.....	65,618	364,559	.....
Actinomycosis	661	22,081	.....	5	.....	2	.....	.....	.....
Hog cholera and swine plague	.....	.....	.....	.....	.....	.....	21,506	729	.....
Tumors and abscesses	180	57,547	62	31	402	59	1,483	32,526	3
Septicemia, pyemia, and uremia	917	.....	234	.....	779	.....	5,545	.....	1
Pregnancy and recent parturition	458	.....	.....	.....	55	.....	323	.....	.....
Pneumonia, pleurisy, enteritis, hepatitis, nephritis, metritis, etc.	1,376	.....	656	.....	1,093	.....	4,540	.....	4
Injuries, bruises, etc.	2,290	2,262	464	43	793	31	592	6,270	1
Lymphadenitis	.....	.....	.....	.....	1,360	4	.....	.....	4
Immaturity	.....	.....	3,585	.....	.....	.....	.....	.....	.....
Sexual odor	.....	.....	.....	.....	.....	.....	816	.....	.....
Miscellaneous	2,746	754	1,345	162	5,042	200	5,456	32,077	29
Total	27,933	93,174	6,414	245	9,524	296	105,879	436,161	42

[a] This term is applied to carcasses held on suspicion on first post-mortem examination, to be subjected later to more thorough examination for determining final disposition.

SUPERVISING PREPARATION OF MEATS AND PRODUCTS.

Under the new law the inspection does not end with the examination of the carcass at time of slaughter, but extends to the subsequent preparation of the meats and meat food products. The latter service represents the work of a large number of Bureau employees, the total weight of the products so prepared and processed during nine months of the fiscal year being nearly four and a half billion pounds, as shown in the following table:

Table showing the amount of meats and meat food products prepared and processed under Bureau supervision, October 1, 1906, to June 30, 1907.

Kind of product.	Weight.
	Pounds.
Beef placed in cure	137,969,046
Pork placed in cure	2,248,886,322
All other classes placed in cure	6,839,268
Sausage, chopped	267,760,463
Canned beef	82,386,711
Canned pork	16,991,513
All other canned meats	5,817,640
Beef extract	746,151
Lard	1,003,602,287
Compound lard	353,549,027
Edible tallow	34,774,806
Oleo oil	169,129,640
Stearin	80,066,297
Oleomargarin and butterine	55,694,037
Total	4,464,213,208

The following amounts of meats and meat food products were condemned on reinspection from October 1, 1906, to June 30, 1907: Beef, 8,925,179 pounds; pork, 5,844,526 pounds; mutton, 77,770 pounds; veal, 27,112 pounds; total, 14,874,587 pounds.

INSPECTION CERTIFICATES FOR EXPORT MEATS AND PRODUCTS.

Under the present law vessels carrying export shipments of meats and meat food products are allowed clearance only when such shipments are covered by certificates of inspection issued by inspectors of the Bureau, unless such shipments are destined to countries for which the Secretary of Agriculture has waived the certificate requirements as provided by the law; and while for a time certificates were issued only for shipments to Great Britain and Ireland and continental Europe, it has been the general policy to issue certificates for exports to other countries when they were requested.

The following table shows the number of certificates issued to cover export shipments of meats and meat food products during the fiscal year:

Inspection certificates issued for export shipments of meats and meat food products, fiscal year 1907.

Kind.	Number.	Product covered.			
		Beef.	Mutton.	Pork.	Total.
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
Regular	71,125	486,796,494	3,511,444	632,428,670	1,122,736,608
Special	33,976	4,588,895	4,745	231,162,533	235,756,173
Total	105,101	491,385,389	3,516,189	863,591,203	1,358,492,781

In addition to the above there were 1,661 "animal product" certificates issued to cover inedible animal products, such as hoofs, horns, bones, casings, inedible tallow, etc., amounting to 16,347,957 pounds.

The amount of meats and meat food products exported under Bureau certificates as indicated above shows an increase of 129.3 per cent over last year. This increase is due largely to the fact that, under the present law, lard, oleo oil, stearin, edible tallow, and other meat food products are now certified to, a thing that has not heretofore been done.

With reference to the foregoing table, attention is called to the provision of the present law under which meat food products for export to any foreign country may be prepared or packed in preservatives of kinds and in quantities not in conflict with the laws of the foreign countries to which the products are destined. It will be noted that there have been exported under this provision since October 1, 1906, 235,756,173 pounds of this character of product, including beef, mutton, and pork; this product was exported in 481,296 packages bearing "special" stamps as indicated in the following table, and was covered by 33,938 "special" certificates:

Table showing number of stamps issued for edible meats and meat food products and inedible animal products, fiscal year 1907.

Kind of stamps.	Number.
Regular	35,954,701
Special	481,941
Regulation 50	722,427
Animal product	50,323
Total	37,209,392

In addition to the above there have been used during the year 1,770,412 self-locking seals, for the identification of sacks and burlap-covered barrels containing meats and meat food products.

MICROSCOPIC INSPECTION.

There has been no microscopic inspection of pork during the fiscal year 1907. At the beginning of the year nine establishments had stocks of microscopically inspected pork on hand amounting to 4,448,361 pounds; of this amount, 8,870 packages, weighing 2,360,411 pounds, were exported under 238 certificates, during the months of July, August, September, and October, 1906, the remainder being disposed of as regular stock. The Bureau records of microscopically inspected pork were therefore closed with the month of October, 1906.

The following table shows by years the quantity of pork exported to countries requiring microscopic inspection during the entire period since the inauguration of that inspection:

Quantities of pork exported to countries requiring microscopic inspection, fiscal years 1892 to 1907.

Year.	Pounds.	Year.	Pounds.
1892	22,025,698	1900	55,809,626
1893	8,059,758	1901	35,942,404
1894	18,845,119	1902	33,681,229
1895	39,355,230	1903	19,108,341
1896	21,497,321	1904	9,020,521
1897	42,570,572	1905	14,721,935
1898	120,110,356	1906	26,566,409
1899	108,858,149	1907	2,360,411

CONTROL OF CONTAGIOUS DISEASES.

TEXAS FEVER.

The shipments of cattle during the quarantine season of 1906 from the area quarantined for Texas fever to northern markets for immediate slaughter show a falling off of 21.8 per cent as compared with the quarantine season of 1905, the whole number of such cattle being 1,000,629, shipped in 36,213 cars. There were also inspected in the provisionally quarantined areas of Texas and Oklahoma 126,238 head of cattle, which were permitted to be moved north for purposes other than immediate slaughter.

Supervision was exercised over 137,902 dippings in crude petroleum, and over the cleaning and disinfection of 36,895 cars.

On account of the unusual number of outbreaks of Texas fever in 1906 at points outside of the quarantined area, and because the regulations of the Secretary of Agriculture, effective April 15, 1907, made necessary some changes in the construction of quarantine pens, it was deemed advisable to make an investigation of the yards in which southern cattle are handled en route to northern markets and at destinations. A live-stock inspector has been detailed to this work.

Wherever he finds upon a personal inspection that the regulations are not complied with, or that unsafe conditions exist, the Bureau takes up the subject with the transportation and stock-yard companies, requesting that the necessary alterations or improvements be made or that the use of the yards for handling southern cattle be discontinued. This work has already resulted in the improvement of a number of yards and the abandonment of some for the purposes indicated, and in every instance has called forth expressions of willingness to conform to the requirements of the regulations.

THE ERADICATION OF CATTLE TICKS.

During the fiscal year 1907 the work of eradicating cattle ticks has been pursued to a greater or less extent in the States of Virginia, North Carolina, South Carolina, Georgia, Alabama, Tennessee, Kentucky, Arkansas, Texas, Missouri, California, Louisiana, and the Territory of Oklahoma. Briefly stated, it has included 1,934,488 inspections of cattle, 539,674 of which were reinspections; thus indicating the inspection of 1,394,814 individual cattle, these making up 95,566 herds. The work has been done in cooperation with State authorities. At the close of the fiscal year the Bureau force engaged in this work numbered about 220 men. During the fiscal year there were released from quarantine areas amounting to approximately 20,000 square miles, and 20 counties previously in quarantine were admitted to provisional quarantine.

As by far the greater part of the work must be done during the warm months, the work of each season falls within two fiscal years. Instead, therefore, of confining this report to the fiscal year ending June 30, 1907, a statement has been prepared showing the operations and results from January 1 to October 31, 1907, as follows:

Summary of tick-eradication work and its results, January 1 to October 31, 1907.

State.	Inspections.		Disinfections.		Territory released or prepared for early release from quarantine.		
	Herds.	Cattle.	Herds.	Cattle.	Whole counties.	Parts of counties.	Area in square miles.
Virginia	47,083	120,234	1,549	8,710	6	.....	3,022
North Carolina	62,717	22,344	2,309	14,137	13	3	6,345
Georgia	13,148	53,293	7,999	32,631	3	.....	611
South Carolina	7,944	49,633	1,030	9,140	.....	.....	.....
Tennessee	112,931	654,394	21,386	122,952	6	6	3,545
Alabama	5,146	40,900	1,335	12,913	.....	.....	.....
Kentucky	5,835	27,664	1,424	6,769	.....	.....	.....
Louisiana	5,498	38,536	5,135	37,264	.....	.....	.....
Arkansas	12,212	96,380	1,461	9,952	5	.....	3,071
Oklahoma	13,564	136,043	4,132	43,215	.....	8	2,230
Texas	863	418,236	586	286,187	1	.....	660
California	2,930	450,277	1,800	191,925	3	2	21,486
Total	289,871	2,307,934	50,146	775,795	37	19	40,970

While most of the work has been and will doubtless continue to be done in areas contiguous to the quarantine line, encouragement has been given to local work in any part of the quarantined area in the assurance that when any considerable area is rendered tick free it will be released from quarantine. Such effective work was done in two parishes of Louisiana that they are almost tick free and have already been given provisional quarantine.

It will be noted from the table that considerable work was done in Arkansas, a State which has heretofore been wholly below the quarantine line, and that as a result of this work five counties are to be entirely released from quarantine and one other county is to be given povisional quarantine.

Such good results were obtained in California that an area of about 20,000 square miles was released from quarantine August 1, 1907, and it is believed to be only a question of a short time when the infection in California will be confined to a comparatively small area along the southern coast.

Various approved methods for the eradication of ticks have been used, including pasture rotation, and dipping, spraying, and hand dressing with oil and oil emulsion. In sections where there were large herds and large ranches dipping or spraying on a large scale has been carried out, either alone or in connection with pasture rotation, while in other sections, where the cattle on some farms frequently consisted only of a cow or an ox team, hand dressing with oil was found to be the only practicable method. The Bureau furnished Beaumont crude petroleum, spraying outfits, and a dipping cage for demonstration work in different localities.

On December 5 and 6, 1906, there was held at Nashville, Tenn., a conference of Federal and State representatives to consider plans for the eradication of the cattle tick. The proceedings of the conference, consisting of papers and discussions, were published as Bureau Bulletin 97. It was suggested at this conference that meetings be arranged for instructing both State and Federal representatives who were to be engaged in the tick-eradication work in farm management, rotation of crops, and such other subjects as would better fit them for dealing with the question in the different localities where the work was to be done. Accordingly two meetings were held—one at Chattanooga, Tenn., the latter part of April, and the other at Richmond, Va., early in May. These meetings, which were really schools of instruction, were addressed by persons selected by the State authorities interested, and were of great value to all who attended them.

Besides Bulletin 97, above referred to, there were issued and widely distributed two circulars (97 and 110) giving information as to methods for exterminating the tick.

SCABIES IN SHEEP.

The total number of inspections of sheep for scabies was 62,625,831 (including 68,264 goats inspected for scabies at slaughtering centers), and the total number of dippings was 12,133,466, of which 2,640,408 were redippings. This is an increase of 5.7 per cent over the inspections made during the previous fiscal year, and a decrease of 2.1 per cent in the dippings.

The following table shows the number of inspections and dippings of sheep for scabies, and the cars cleaned and disinfected on that account, for the past eight years:

Inspections and dippings of sheep for scabies, and cars cleaned and disinfected, 1900 to 1907.

Fiscal year.	Inspections.	Dippings.	Cars cleaned and disinfected.
1900	1,801,392	626,838	.....
1901	7,912,724	1,034,368	.....
1902	11,186,661	1,017,162	791
1903	16,444,370	2,167,002	752
1904	40,967,961	9,578,476	2,732
1905	53,680,786	16,873,659	7,965
1906	59,246,288	12,396,976	8,625
1907	62,625,831	12,133,466	6,275

The prevalence of sheep scab has been considerably reduced, and since the close of the fiscal year the quarantine for this disease has been removed from Wyoming and Idaho, and it is expected that later it may be removed from Utah. Such headway has been made as to give hope that with another year's work the disease may also be eradicated from Colorado, New Mexico, and Arizona.

SCABIES IN CATTLE.

During the fiscal year 1907 there were 15,243,323 inspections of cattle for scabies and 436,623 dippings, of which 30,342 were redippings. These figures indicate an increase of 1.7 per cent in inspections and of 91.4 per cent in dippings as compared with the previous fiscal year.

The following table shows the growth of this work during the past four years:

Inspections and dippings of cattle for scabies, and cars cleaned and disinfected, 1904 to 1907.

Fiscal year.	Inspections.	Dippings.	Cars cleaned and disinfected.
1904	1,124,321	162,554	532
1905	14,085,267	563,394	29,897
1906	14,983,260	243,826	19,992
1907	15,243,323	466,623	15,009

SCABIES IN HORSES.

The total number of inspections of horses for scabies was 24,662, and the total number of dippings (or sprayings) was 1,319.

WORK OF THE QUARANTINE DIVISION.

The Quarantine Division, of which Dr. R. W. Hickman is chief, has under its supervision all work of the Bureau in connection with the exportation and importation of live stock, including the management of the quarantine stations at various ports of entry for imported animals. It also has charge of certain miscellaneous investigations of contagious diseases of animals.

INSPECTION OF VESSELS AND EXPORT ANIMALS.

The ships carrying exported animals are inspected and regulations as to fittings, equipment, ventilation, feed, water, attendants, etc., are enforced. During the fiscal year 741 vessels were inspected before clearance.

The following table gives statistics of inspection of live animals for export during the year:

Number of American and Canadian animals inspected for export, number rejected, and number exported, fiscal year 1907.

Kind of animals.	American.			Canadian.		
	Number inspected.	Number rejected.	Number exported.	Number inspected.	Number rejected.	Number exported.
Cattle	352,080	586	351,494	52,718	21	52,697
Sheep	96,933	15	96,918	31,544	64	31,480
Goats	15	.....	15	.....	.....	.....
Swine	1,259	.....	1,259	.....	.....	.....
Horses	1,258	.....	1,258	3	.....	3
Mules	479	.....	479	.....	.....	.....
Donkeys	2	.....	2	.....	.....	.....
Total	452,026	601	451,425	84,265	85	84,180

Most of the animals included in the foregoing statement as exported were shipped to Great Britain. There went to that country, of the American animals, 341,742 cattle, 57,315 sheep, and 763 horses, and all of the Canadian animals except 73 cattle and 4 sheep. Next in number were shipments to Canada, 38,029 sheep and 241 horses having been inspected for shipment to that country.

The following table shows the number of animals inspected on landing at the three British ports where the Bureau maintains inspection and to which the greater part of the exports go, also the number and percentage lost in transit. It will be observed that under the Bureau's supervision of this traffic the percentage of loss is very low.

Number of animals inspected at time of landing at British ports, and the loss in transit, fiscal year 1907.

From—	Cattle.			Sheep.			Horses.		
	Landed.	Lost.	Per cent of loss.	Landed.	Lost.	Per cent of loss.	Landed.	Lost.	Per cent of loss.
United States	341,071	455	0.13	55,786	351	0.63	788	1	0.13
Canada	55,720	148	.27	30,886	332	1.07	3	.....	.....
Total	396,791	603	.15	86,672	683	.79	791	1	.13

NEW CANADIAN REGULATIONS.

On March 1, 1907, the new Canadian regulations relating to the quarantine of animals became effective, prohibiting the importation into Canada from the United States of branded or range western horses, mules, and asses, other than those which are gentle and broken to harness or saddle, and requiring the inspection of horses, mules, or asses, other than those comprising settlers' effects, and that the same must be accompanied by (1) a satisfactory certificate of mallein test, dated not more than thirty days prior to the date of entry and signed by an inspector of the United States Bureau of Animal Industry, or (2) a similar certificate from a reputable veterinarian, provided such certificate is indorsed by an inspector of the Bureau of Animal Industry, or (3) a similar certificate from an inspector of the Canadian department of agriculture. Horses, mules, or asses forming part of settlers' effects are required to be inspected and to be accompanied by such certificates of mallein test, otherwise they are subject to the mallein test by an inspector of the Canadian department of agriculture at any time after their arrival in Canada, and if found to react within a period of six months from the date of entry they will be destroyed without compensation.

From March 1 to June 30, 1907, 214 horses were reported as inspected and subjected to the mallein test by Canadian official veterinarians at the border, 23 of which number have been rejected on account of reacting to the test. Seventy-six horses were inspected and tested by Bureau veterinarians for shipment to Canada, accompanied by satisfactory certificates of mallein test.

Three hundred and fifteen cattle intended for exportation to Canada were tested with tuberculin by the Bureau, and of these 290 were passed and 25 were rejected.

INSPECTION AND QUARANTINE OF IMPORTED ANIMALS.

In order to exclude from this country the contagion of the destructive animal diseases which exist in other parts of the world, it is necessary to use the utmost vigilance with regard to imported ani-

mals. All animals offered for importation are required to be inspected, and certain kinds when coming from certain countries are required to be quarantined for a sufficient period to insure their freedom from contagion. Cattle from Great Britain, Ireland, and the Channel Islands are imported subject to the test of a Bureau inspector stationed in Great Britain. Importations from Canada are received without quarantine when accompanied by a satisfactory certificate of tuberculin test by a Canadian official veterinarian, otherwise they are subjected to quarantine and the tuberculin test at the border line by an inspector of this Bureau.

Owing to the large number of zoological animals imported and the uncertainty as to their immediate origin, blood tests have been made in the case of all those whose natural habitat was such as to give rise to a suspicion of the possible presence in their blood of the causative agent of surra or rot, the *Trypanosoma evansi.* In an importation of 51 head of Indian cattle 17 animals were destroyed, owing to the demonstrated presence in their blood of this trypanosome.

The following table shows the number of imported animals inspected and quarantined and the number admitted on inspection without quarantine during the fiscal year:

Number of imported animals inspected, with and without quarantine, during fiscal year ended June 30, 1907.

QUARANTINED.

Port of entry.	Cattle.	Sheep.	Swine	Goats.	Other animals.
New York	377	521	13	.....	[a]128
Boston	20	4	4	.....	.....
Baltimore	130	65	3	.....	.....
Canadian border ports:					
Beecher Falls, Vt	20	2	.....	.....	.....
Buffalo, N. Y	2	8	.....	.....	.....
Cape Vincent, N. Y	4	.....	4	.....	.....
Danforth, Me	3	.....	.....	.....	.....
Eastport and Calais, Me	5	1	.....	1	.....
Fort Fairfield, Me	30	20	.....	.....	.....
Hogansburg, N. Y	2	.....	2	.....	.....
Houlton, Me	.....	13	.....	.....	.....
Island Pond, Vt	.....	3	7	.....	.....
Lowelltown, Me	1	.....	.....	.....	.....
Massena, N. Y	1	.....	.....	.....	.....
Niagara Falls, N. Y	1	.....	.....	.....	.....
Ogdensburg, N. Y	2	.....	.....	.....	.....
Richford, Vt	9	.....	.....	3	.....
St. Albans, Vt	31	.....	.....	.....	.....
Sault Ste. Marie, Mich	3	.....	.....	.....	.....
Vanceboro, Me	2	1	2	.....	.....
Total quarantined	643	638	35	4	128

[a] Comprises 56 deer, 7 gnu, 15 antelopes, 26 camels, 11 llamas, 2 springbok, 1 mouflon, 4 zebus, 1 yak, 1 peccary, 1 Red River hog, 2 reindeer, 1 aoudad.

Number of imported animals inspected—Continued.

NOT QUARANTINED.

Port of entry.	Cattle.	Sheep.	Swine.	Horses.	Mules and asses.	Goats.	Other animals.
New York				3,252		[a]6	[b]7
Boston				227			
Philadelphia				16			
Baltimore				36			
Portland, Me				41			
New Orleans, La.							
San Francisco				4			
From Mexico:							
El Paso[c]	13,844		7	9	3	7	[d]2
Eagle Pass		2,994	11	215	19	12	[e]12
Laredo, Tex.				34	9		[d]3
Nogales, Ariz	10,206		14	8	11		[d]1
San Diego, Cal.	1,070	1,818	59	289	72	219	
Calexico, Cal.[f]	3,683	3,229	219	201	374		
Los Algodones[g]				133	485		
Brawley, Cal.[h]				10			
Canadian border ports:							
Eastport, Me.	1			11			
Calais, Me				32			
Houlton, Me.	2	2		36			
Fort Fairfield, Me	58		2	39			
Vanceboro, Me.	8	420		31			
Monticello, Me				11			
Bridgewater, Me				8			
Limestone, Me.	2						
Lowelltown, Me.	61			8			
Mars Hill, Me				14			
Van Buren, Me.				12			
Danforth, Me.	1			6			
Jackman, Me.				4			
Island Pond, Vt.	38	133		45			
Beecher Falls, Vt.	29	1		52			
Newport, Vt.	99	60	5	179		3	[d]2
North Troy, Vt.	12	14		12			
Derby Line, Vt.	8	1	3	32			
Richford, Vt.	7	6	7	188		3	
Alburg, Vt.	1			41		1	
Burlington, Vt				1			
St. Albans, Vt.	33	26	2	72			
Swanton, Vt.		8		38			
Rouses Point, N. Y.	15	183		28			
Chateaugay, N. Y.	66			31			
Mooers, N. Y.	223			72			
Fort Covington, N. Y.	20			8			
Malone, N. Y.	155	46		15			[i]1
Ogdensburg, N. Y.	42	4	1	82			
Morristown, N. Y.	5	856	2	11			
Waddington, N. Y.			1	32			
Hogansburg, N. Y.	4			6			
Massena, N. Y.	2		4	2			
Cape Vincent, N. Y.	97			28			
Clayton, N. Y.		2	1	1			
Buffalo, N. Y.	579	86,554	88	1,058		2	[j]4
Niagara Falls, N. Y.	169	182	42	730	17		
Rochester, N. Y.				8			
Port Huron, Mich	151	7,486	58	281	4		[k]2
Detroit, Mich.	904	481	112	595		9	
Sault Ste. Marie, Mich.				83			
Total not quarantined...	31,595	104,506	638	8,418	996	262	34
Grand total	32,238	105,144	673	8,418	996	266	162

[a] In bond from France to Mexico.
[b] Zebras.
[c] The figures for El Paso include 16 cattle in transit to Lower California and 1,743 cattle, 2 swine, and 1 horse in transit to Mexico.
[d] Deer.
[e] Comprises 6 deer, 2 camels, 2 zebras, and 2 zebrules.
[f] Including 2 cattle, 3,070 sheep, 145 horses, 295 mules, and 1 jackass, United States animals returned.
[g] Including 131 horses and 482 mules, United States animals returned.
[h] Including 3 United States horses returned.
[i] Dog.
[j] Elephants.
[k] Moose.

TUBERCULIN TEST IN GREAT BRITAIN.

For the convenience of importers of fine breeding cattle the Bureau has continued making tuberculin tests in Great Britain of cattle intended for importation into the United States. The results of these tests during the fiscal year are shown in the following table:

Results of tuberculin tests in England of cattle for importation, fiscal year 1907.

Breed.	Passed.	Rejected.
Jersey	12	1
Aberdeen-Angus	7	.....
Ayrshire	44	7
Guernsey	56	1
Kerry	4	1
Dutch	39	1
Total	162	11

Two importations, consisting of 15 cattle, were received at the quarantine station for the port of New York without having been tested by the Bureau veterinarian stationed in Great Britain, and were therefore tested with tuberculin at the station. Nine of the number were condemned as tuberculous—8 Guernsey and 1 Dutch Belted.

ERADICATION OF VENEREAL DISEASE IN HORSES.

The work of investigation in connection with suspected cases of the disease known as "maladie du coït," or "dourine," has been continued throughout the year, with Dr. E. T. Davison in the field. Numerous suspected cases have been reported from time to time in different sections of the country by veterinarians and horsemen, but in every instance it has been shown on investigation to have been some other disease simulating maladie du coït in some particulars, and usually proving to be coital exanthema, or some other disease, such as an irregular form of rhinoadenitis or strangles, or a sequela of that affection; or possibly some of the animals were affected with farcy, summer sores, sclerostomiasis, etc. Investigations have been made in various parts of South Dakota, Nebraska, the Indian reservations, Washington, Oregon, Wyoming, Oklahoma, and Montana. A careful inspection has been made of the range horses in the principal range States during this season, several thousand animals having been inspected in such States in the round-up work, with the assistance of veterinary inspectors engaged in other lines of field service, such inspections having been made for the detection of scabies, glanders, and dourine. The general method has been to have the horses in any section of the country that has ever been regarded with suspicion rounded up during the breeding season and examined. In the

State of Montana the horses on the Indian reservations have likewise been examined, not because of disease having been reported among the Indians' horses in Montana, but because of the fact that if there were any disease in the country the conditions prevailing on the Indian reservations would be likely to furnish an ideal medium for its development and dissemination. Representative herds of range horses have likewise been examined, even when such herds have never been regarded as suspicious. All herds that have ever been regarded with suspicion are still kept under surveillance. Inspectors have been present at the large sales of range horses in Montana, and no horses have been rejected as dourine suspects at the Canadian border.

It seems, from all of the circumstances connected with the investigations that have been made of suspected cases and outbreaks of this disease during the past year and for several preceding years, that a point has at last been reached in this work giving ample foundation for the belief that the disease has been stamped out, and that unless again imported there will be no recurrence of it in this country. The reports of the Bureau veterinarians engaged in this work show 14,720 inspections during the fiscal year, with no case of maladie du coït discovered.

INVESTIGATION OF A DISEASE OF HORSES.

In July and August, 1906, field investigations were made of a disease among horses in Holt County, Nebr., resembling surra in many of its characteristics, and which had repeatedly been reported as such by laymen who had read Bureau Bulletin 42, Emergency Report on Surra, which was issued because this disease had been found to exist in the Philippine Islands. The disease occurring in Nebraska, however, appears to be the same as that reported from portions of Kansas and some other States and commonly known as swamp fever. Cooperative laboratory investigations of this latter disease by the Bureau and the Minnesota Agricultural Experiment Station are in progress at that station, and are hereinafter referred to in reporting the work of the Pathological Division.

In the course of his field work Doctor Davison was able to reduce greatly the mortality from this affection by a course of treatment which he adopted and as a result of which a number of animals promptly recovered. The same treatment was prescribed and very successfully used in an outbreak of the disease in Kansas. As an antipyretic he gave 40 grains of quinine, 2 drams of acetanilid, and 30 grains of powdered nux vomica four times daily. Cold water sponge baths were given, and in addition frequent copious injections of cold water per rectum, which had a beneficial effect in reducing

the temperature and likewise in stimulating peristalsis of the bowels, which, as a result of the disease, show a tendency to become torpid during the fever. He found it better to avoid giving purgatives unless absolutely necessary, on account of their debilitating effect. As a rule the affected animals ate fairly well during the first three or four days of the febrile attack, and if given laxative, easily digestible foods, obstinate constipation calling for the administration of purgatives may be avoided. But not infrequently a dirty, yellowish tinge of the visible mucous membranes has been observed, in which cases 20 grains of calomel in from 2 to 4 drams of aloes in a ball was given, or 2-dram doses of fluid extract of podophyllin seemed to answer equally well. Following the subsidence of the fever a tonic was administered, composed of iron, quinine, nux vomica, and gentian, in combination.

WORK OF THE PATHOLOGICAL DIVISION.

The work of this division, under Dr. John R. Mohler, chief, consists mainly of the scientific investigation of animal diseases. Some of the investigations mentioned in the last report have been concluded and the results have either been published or are at present in the hands of the printer, while others have continued to be the subject of further consideration.

SCIENTIFIC INVESTIGATIONS OF DISEASES.

SWAMP FEVER IN HORSES.

A disease known as swamp fever, which prevailed among the horses of the Red River Valley, in Minnesota, was investigated in cooperation with the Minnesota Experiment Station, and already definite results have been obtained which not only throw new light upon the infection but are highly encouraging with reference to the possibility of obtaining a satisfactory treatment for the disease.

Confining conclusions strictly to the observations drawn from these experiments, the following summary is presented:

(1) Swamp fever is caused by a micro-organism and not by chemical poisons or poisonous plants.

(2) It is transmissible among horses and mules by inoculation.

(3) The virus is present in the blood. It has been demonstrated by inoculation tests to be present in the blood as much as nineteen days before death and twenty-four hours after death.

(4) The disease has been transmitted to a horse by subcutaneous inoculation of 5 c. c. of blood.

(5) The incubation period is approximately from ten to thirty days, at the end of which time the first symptom, a rise in temperature, appears. The disease when uncomplicated follows a chronic course terminating in death.

(6) The disease is characterized by fevers recurring at irregular intervals and by progressive anemia, emaciation, and weakness. The pulse in the later stages is accelerated, though weak, stringy, and sometimes intermittent. The appetite is tremendous, and remains so even after the animal has become very weak. There is a marked wasting of the flanks and hind quarters, causing in the later stages of the disease a dragging and staggering gait of the hind legs.

(7) The most constant and characteristic lesions are found in the circulatory system, mainly in the heart.

Among the important problems which it is hoped that future experiments will solve are the following:

(*a*) The nature of the virus and its isolation.

(*b*) Its distribution in the body, and also whether it is contained in the excreta.

(*c*) Whether the disease can be transmitted by the alimentary tract—that is, by feeding.

(*d*) The natural mode of transmission and infection.

(*e*) The susceptibility of other animals than horses and mules.

(*f*) Methods of prevention and cure.

SURRA.

The past year has again demonstrated very forcibly the great advantages accruing to the country from the supervision which the Bureau of Animal Industry holds over animals brought to our ports of entry from abroad.

An importation of 51 carefully selected cattle from India (*Bos indicus*) during the summer season of 1906 brought to the New York port a number of animals that were found by blood examination to be harboring the animal parasite *Trypanosoma evansi*, the specific cause of surra. As serious losses had been experienced in the Philippines and in countries of the East through the infection of both horses and cattle with surra, it was at once determined to use every precaution in safeguarding the cattle and horses of this country from its fatal attacks. Each of the Indian cattle that developed the disease was promptly slaughtered and burned, and the healthy portion of the herd was kept carefully isolated in individual screened stalls of a fly-proof stable until repeated blood examinations had shown that they were free from trypanosomes, and until killing frosts in the late fall had removed all danger of the transportation of virulent blood from animal to animal by means of blood-sucking flies.

From this importation of surra much has been learned of the character of the disease and of the remarkable periodical development of the living parasites within the blood of the affected animal. Virulent blood drawn from an affected animal and injected into a test rabbit will cause a sharp elevation of temperature after a period usually varying from five to eight days, but occasionally this period extends to ten or eleven days. At the time of the acme of the fever attack if an examination is made of the blood of the inoculated animal numerous wiggling and squirming organisms will be seen moving about rapidly among the blood corpuscles and manifesting their presence by an active disturbance of all corpuscles with which they come in contact. If the blood is examined daily these moving hematozoa may be found present for two, three, or four days, when they suddenly disappear, while the temperature returns to normal. Now follows a latent or quiescent period lasting for five or six days, during which the temperature of the animal remains at or near the normal point, and the animal eats as usual, only showing the effects of the parasitic invasion by a staring coat and by a slight loss of flesh and energy. At the end of the latent period the same course is repeated, and again an elevation of temperature and a return of the parasites occur, only to disappear more or less suddenly at the termination of the attack. These recurring periods of disease gradually undermine the strength and vitality of the animal until it succumbs.

Post-mortem examination of such an animal shows, first, general emaciation and also that the hair has fallen from around the eyes, mouth, and nose, leaving bare denuded patches. The external genitals are swollen and edematous and more or less bare of hair. On opening the carcass it will be seen that the skin is firmly adherent to the tissues underneath, that considerable clear fluid has entered the peritoneal cavity, that the abdominal viscera have formed numerous fibrous attachments to the peritoneal walls, and that similar little fibers unite the various visceral organs into a more or less compact mass. The spleen will be found greatly enlarged, even to six or eight times its normal size. The liver and all of the thoracic organs will usually be found unchanged. Variously scattered over the surfaces of the abdominal walls, both internal and external, may be found small collections of the débris of degenerated red blood corpuscles, and the outer surfaces of the digestive organs within the peritoneal cavity may exhibit scattered remains of similar hemorrhages.

The disease produces very similar conditions in horses following natural infection, and may be readily transmitted to ruminants and canines by means of infectious blood. Healthy rabbits were for experimental purposes placed in cages with rabbits that had been infected through injections of virulent blood, but no infection followed, even though they remained in this close contact for thirty

days, eating and drinking from the vessels used by the diseased animals.

It will at once be evident that the spread of such a disease as this over the country would quickly lead to great destruction of live stock and to great financial loss. To prevent these losses the best efforts of this Bureau have been exerted and the disease has been rigidly controlled.

GLANDERS.

This disease continues to be prevalent in various parts of the country. Cases have occurred among army horses at Fort Myer, Va., in the quartermaster's stables at Washington, D. C., and in several private stables in the vicinity of this city. In conjunction with local veterinarians 11 cases have been diagnosed and destroyed in this section.

In July, 1906, an enzootic of glanders occurred in Dayton, Ohio, which was investigated by the Bureau at the request of the State veterinarian of Ohio, against whom injunction proceedings had been brought to restrain him from killing horses which responded to the mallein test. A dozen horses reacted to the test, half of which were showing clinical symptoms of the disease. Post-mortem examinations made on a number of the animals killed on account of having reacted to mallein showed lesions of glanders in the lungs and thoracic lymph glands. A number of tubes of potato media were inoculated in Dayton and brought to the laboratory in Washington, where typical cases of glanders in guinea pigs were produced by inoculating the cultures which had developed in the potato tubes.

In February, 1907, a severe outbreak occurred at Ames, Iowa, and the Bureau was called on to confirm the diagnosis. Material from two of the cases was forwarded, both of which were proved by guinea-pig inoculations and cultures to be positive cases.

Some work has been done with the agglutination method as a means of diagnosis, and when the technique of the procedure becomes somewhat more simplified a valuable additional resource will have been obtained for the diagnosis of occult cases of the disease which give an indefinite mallein reaction.

TUBERCULOSIS.

The investigations relative to the immunization of cattle against tuberculosis have been continued throughout the year in conjunction with the Bureau Experiment Station, and the scope of the work has been extended by the application of the immunizing inoculations to an added number of cattle and also to a number of hogs. Some of this work has been done in conjunction with the Georgia Experiment Station, which, in addition to furnishing a number of cattle from the station herd for test inoculations, obtained permission from stock

owners in the vicinity to have the experiment extended to some of their young cattle. This work, as formerly, consists in applying the immunizing test in a variety of ways, that the comparative efficiency of the various methods may be determined.

A number of cattle that have reacted to the tuberculin test, thus proving that they are diseased with tuberculosis, have been purchased and are being treated by various methods with living and sterilized cultures of bacilli, for the purpose of perfecting, if possible, some method of treatment which will serve to check the advance of the disease or possibly overcome it completely.

The examination of sediment taken from the cream separators of public creameries for the detection of tubercle bacilli has been continued, and the presence of these micro-organisms has been demonstrated in about 25 per cent of the samples. This continues to brand the public creamery as an important source of tubercular infection for the hogs and calves that are fed upon the separated milk that is returned to the farm from the creamery, and shows the absolute necessity of having State laws compelling creamery companies to sterilize all milk and other products before returning them to the farmer for use as food for live stock.

The tubercular infection of hogs has been deemed a matter of sufficient importance to warrant a continuance of investigations into the most common means of contracting the disease by these animals. The danger offered to swine by being allowed to run over and feed upon the droppings of tuberculous cattle has been thoroughly tested, also the danger which threatens healthy swine from being brought into contact with feces from tuberculous hogs. The probability of infection being carried from tuberculous brood sows to their litters has been studied, as well as the danger arising from the general herding together of healthy and tuberculous animals.

Owing to the increasing use of tankage from the packing houses as feed for hogs, and owing also to the fact that this substance has been prominently accused of being an important agent in the spread of tuberculosis among these animals, investigations have been carried on with this material with a view to ascertaining the justice of its condemnation as swine feed. The work thus far done fails to show that tankage can be held responsible for originating or spreading tuberculosis among hogs.

The length of time that tubercle bacilli will continue to live and retain their virulence while in butter under usual market conditions is also being made a subject of investigation in cooperation with the Dairy Division. In these investigations butter has been made from milk that has been infected through the addition of bovine tubercle bacilli to the milk just previous to its passage through the cream separator, and another lot has been made from milk obtained

from a cow with a tuberculous udder from which tubercle bacilli were being daily excreted in great numbers. These samples of butter have been prepared in both salted and unsalted condition and have been tested upon guinea pigs both by feeding and by inoculation tests immediately after its preparation, again after keeping in cold storage for a period of ten days, and again thirty days afterwards; and it is intended to repeat the tests after three and six months' retention of the butter in a cold storage plant. The ability of these various samples to cause tuberculosis to develop in the guinea pigs upon which they are tested will serve to demonstrate the length of life which may be expected of tubercle bacilli in both salted and unsalted butter when stored under ordinary market conditions for different periods of time.

In the year 1902 thoroughgoing and extensive experiments were begun for the purpose of studying the comparative characters of human, bovine, and avian tubercle bacilli. These investigations have been continued without cessation until the present time, and have led to the production of Bulletin No. 96 of this Bureau, which contains the results of this long series of experiments.

Another line of investigation inaugurated at the same time has been carefully brought to a satisfactory close. This was a study of transformability of tubercle bacilli from one type to another when subjected to unusual conditions of growth, both within animal hosts and upon artificial culture media. The results of these investigations are given in an article in the Twenty-third Annual Report of the Bureau of Animal Industry (p. 113).

TUBERCULIN TESTING OF CATTLE.

During the past year there has been considerable agitation in the District of Columbia with reference to the improvement of its milk supply. In response to the public feeling which was thus aroused, the Commissioners of the District appointed a committee or conference composed of scientists, physicians, veterinarians, milk producers and dealers, attorneys, and business men to consider methods for obtaining pure and wholesome milk and to advise as to proper legislation to that effect.

An effort is being made by a number of dairymen to produce milk under strict sanitary conditions from cows which are not only apparently healthy but have been proven free from tuberculosis by the application of the tuberculin test.

In order to assist in this work the Secretary of Agriculture, about April 1, directed this Bureau to apply the tuberculin test to the herds of all dairymen who might request such action; consequently the report of this work embraces only the last three months of the fiscal year.

To derive the greatest benefit and permanency from the work, a form of agreement was prepared which must be signed by each dairyman before his application for the test is granted. This agreement provides that all animals which react to the tuberculin test and in addition exhibit clinical symptoms of tuberculosis shall be slaughtered and their carcasses disposed of according to the meat-inspection regulations of the Bureau of Animal Industry, thus placing the disposal of tuberculous carcasses upon a rational and economic basis. Further, all animals which react to the tuberculin test and exhibit no other evidence of tuberculosis may be slaughtered and the carcasses passed for food or condemned, under the conditions named in the first instance, or they must be completely segregated from the healthy portion of the herd and maintained in that condition after the system of Bang. If such animals are producing milk, it is not permissible to use it for any purpose whatsoever without having previously sterilized it. The offspring from these reacting segregated animals must be removed from the parents immediately after birth and fed upon the milk of healthy cows or the sterilized milk of their own parents. These conditions tend to lessen the financial loss to the breeder by enabling him to perpetuate a valuable strain of cattle which he has been creating, and thereby gradually to build up a new herd which will be entirely free from tuberculosis.

In addition to these measures, the agreement provides for the thorough disinfection of contaminated premises and the compliance with all reasonable sanitary measures recommended by the Bureau of Animal Industry or the health department of the District of Columbia. The permanency of the work in suppressing tuberculosis is further assured by a clause which provides that no cattle shall be added to the tested herd unless they have passed the tuberculin test applied by an agent of the Bureau of Animal Industry or of the health department of the District of Columbia.

A system of tagging the ears of all cattle tested is in use. Two varieties of tags are used, stamped in serial numbers, one variety to be attached to the right ears of passed animals and the other to the left ears of the reacting animals.

The work is being carried out in the District of Columbia, Maryland, and Virginia, Already the Pathological Division has tested 28 herds, representing 526 cattle, of which 99 head, or 18.82 per cent, proved to be tuberculous. In addition to this there are records of 9 herds tested by District of Columbia veterinarians which include 132 cattle, of which 19 head, or 14.39 per cent, proved to be tuberculous. Taking the totals of the amount of testing performed, it appears that in 37 herds, embracing 658 cattle, 118 animals, or 17.93 per cent, proved to be tuberculous. This percentage illustrates the great necessity of the work which is being performed.

The results which are already evident are highly encouraging, as each herd tested acts as a nucleus for the development of an educational center which is of great value to the farmer and the dairyman in creating an attitude favorable to the production of milk free from the contamination of disease germs.

It is also worthy of note that the herds belonging to all of the public institutions in the District of Columbia are tuberculin tested and are now free from tuberculosis.

FOWL TUBERCULOSIS.

In the early spring of 1907, by following up a correspondent's inquiry in a poultry journal, the location of another center of avian or fowl tuberculosis in this country was found. This is only the fifth positive demonstration of the disease on the American continent. Thus far fowl tuberculosis has been located in Oregon (by Pernot, 1900), in California (by Moore and Ward, 1903), in Canada (by Higgins, 1905), in New York (by Burnett, 1907), and in the southeastern corner of Michigan in February of this year by the Pathological Division. Other writers have reported the disease, but the failure to make bacteriological demonstration makes the reports useless as scientific evidence. In the cases investigated by this Bureau both dead and live birds were received from Michigan showing generalized abdominal tuberculosis, as attested by microscopic demonstration of the tubercle bacillus and by feeding experiments which resulted successfully in four months.

The importance of continued investigation on this line is shown by the fact that numerous vague diagnoses, under the title of "liver disease," "spotted liver," "going light," "rheumatism," etc., are abroad in poultry circles, some of which in the above-mentioned demonstrations have been proved to be tuberculosis, thus suggesting that chicken tuberculosis is much more extensive in its depredations than hitherto realized. The finding in the feces by all investigators of multitudes of bacilli suggests the ease with which the disease may spread throughout a flock. It must be admitted that in the present state of our knowledge of this disease in mammals and birds the appearance of tuberculosis in a flock of chickens opens up for that locality all the questions connected with the plague.

Canaries are reputed frequently to die with tuberculosis. As a matter of fact, however, among all the notes of post-mortem examinations held on canary birds in this laboratory there is not a single record of a case of tuberculosis. In May, 1906, as previously reported, some dead canaries were received from a fancier in Washington, D. C., which presented a most perfect picture of tuberculous infection. Microscopic examination, however, failed to reveal any acid-fast bacilli, but did bring to light a streptobacillary organism

which after inoculation in pure culture into pigeons and other experiment animals perfectly reproduced the disease that had been killing the canary birds. Further study showed that it was a question of the streptobacillary pseudo-tuberculosis of canaries reported by Nocard, the same as the "tuberculose zoogleique" of Malassez and Vignal. A few months later some new cases were received from another breeder of canaries. The present note is made not merely because of the finding of a new center of infection during the past year, but also on account of the fact that Roger has reported in the Revue Vétérinaire, December 1, 1905, the finding of this disease in a chicken. The occurrence of the pseudo-tuberculosis sporadically among poultry only further demonstrates the necessity for careful bacteriologic examination in all cases of supposed tuberculosis among chickens.

Of further interest as bearing upon the question of tuberculosis was the case of a pigeon brought to the laboratory, suspected of being crop-bound. The tumor mass was a little high for that condition, and upon operation it was found to be a yellow, cheesy tumor, the size of a hickory nut, attached to the cervical vertebræ and incorporating within its mass the esophagus and trachea. Microscopic examination proved it to be tuberculosis. This bird was a 5-weeks-old squab from perfectly healthy parents. The owner and his family are apparently in excellent health, without the slightest suggestion of tuberculosis. However, the owner had just dismissed a colored boy whose general appearance and offensive habit of hawking and spitting about the yards and the pigeon loft had led him to fear tubercular infection. It is to be regretted that examination of the boy could not have followed the finding of the tubercle bacilli in the pigeon.

RABIES.

The Pathological Division has continued to examine all cases of suspected rabies where laboratory assistance was desired. The presence of the so-called Negri bodies in the hippocampus major is at present considered to be the most valuable method of diagnosis. In all cases where they are found and the changes in the plexiform ganglia are also present a diagnosis of rabies is at once reported and rabbit inoculations are not made.

Forty-seven suspected cases were received during the year, of which number 27 (all dogs except 2—a sheep and a cat) were found to have been affected with the disease. Twelve of the positive cases were from the District of Columbia, 6 from Virginia, 5 from Maryland, and 1 each from Maine, Wisconsin, North Carolina, and South Carolina.

In two of the cases, Nos. 725 and 905, we were unable to give a diagnosis by either of the rapid methods of examination. No. 725

was chloroformed early in the disease, which is sufficient to account for the negative microscopic findings. No. 905, on the other hand, died naturally, and is an example of those rare cases where rabbit inoculations are necessary to establish a diagnosis even when the disease has run its course.

Below is a tabulated list of the positive cases:

List of cases of rabies investigated by the Bureau during fiscal year 1907.

Date.	Record No.	Kind of animal.	Received from—	Result of inoculation.	Diagnosis by histological examination.	Diagnosis by presence of Negri bodies.	Persons or animals bitten.
1906.							
Aug. 10	670	Dog ..	Calais, Me.....	Positive	None made.	None made.	None.
Sept. 3	698	Dog ..	District of Columbia.	.....do	Positive	.....do	2 dogs and 1 horse.
Sept. 12	708	Dog ..	Clemson College, S. C.	.....do	None made.	Positive	1 child.
Oct. 3	725	Dog ..	Glenn Dale, Md ..	.....do	Negative ...	Negative ...	None.
Oct. 12	735	Dog ..	Hyattsville, Md ..	.....do	Positive	None made.	1 child.
Dec. 21	826	Dog ..	District of Columbia.	.....do	.....do	.....do	2 children.
Dec. 26	828	Dog ..	.....do	.....do	.....do	.....do	2 dogs.
1907.							
Jan. 14	849	Sheep.	La Crosse, Wis....	.....do	None made.	.....do	None.
Jan. 15	850	Dog ..	Norfolk, Va.....	.....do	Positive	.....do	9 persons.
Jan. 19	859	Dog ..	Forest Glen, Md ..	.....do	.....do	.....do	1 person.
Jan. 24	865	Dog ..	District of Columbia.	None made.	.....do	.....do	
Jan. 26	870	Dog ..	.....do	.....do	.....do	Positive	1 person.
Feb. 7	889	Dog ..	Norfolk, Va.....	.....do	.....do	.....do	1 woman.
Feb. 21	905	Dog ..	District of Columbia.	Positive	Negative ...	Negative ...	1 person.
Feb. 25	914	Dog ..	.....do	None made.	Positive	.....do	
Feb. 28	920	Dog ..	Norfolk, Va.....	Positive	.....do	Positive	1 woman.
Mar. 15	942	Dog ..	.....do	None made.	.....do	.....do	1 man.
Mar. 21	956	Dog ..	Wilmington, N. C.	Positive	.....do	None made.	
Mar. 23	965	Dog ..	Norfolk, Va.....	None made.	.....do	Positive	Several persons.
Mar. 30	974	Dog ..	District of Columbia.	.....do	None made.	.....do	1 dog.
Apr. 4	982	Dog ..	Norfolk, Va.....	.....do	Positive	.....do	1 horse.
Apr. 12	994	Dog ..	College Park, Md.	.....do	.....do	.....do	11 dogs.
Apr. 26	1013	Dog ..	District of Columbia.	Positive	.....do	.....do	1 man.
Do...	1016	Dog ..	.....do	None made.	.....do	.....do	
June 5	1076	Dog ..	Bethesda, Md	Positive	.....do	.....do	2 horses, 2 dogs, 1 cow.[a]
June 11	1093	Cat ...	District of Columbia.	.....do	.....do	None made.	2 children.
June 10	1094	Dog ..	.....do	.....do	.....do	.....do	Several animals.

[a] The cow and both dogs developed rabies between the fourth and sixth weeks following the bite of the rabid dog.

MYCOTIC STOMATITIS.

During the fall of 1906 an official of the Pathological Division was sent to Charleston, Huntington, and Buffalo, W. Va., and vicinity, to investigate a reported outbreak of foot-and-mouth disease. The investigation resulted in finding a very severe and extensive outbreak of mycotic stomatitis. The disease was prevalent throughout the Kanawha and Guyandotte valleys and along the Ohio River in the vicinity of Huntington. The disease assumed a very severe type in some cases and for a short time menaced the milk supply of Huntington and Charleston. Complete recovery

resulted in most cases in about one week, while the most severe cases continued for from three to four weeks. The malady was demonstrated not to be inoculable from one animal to another. A former study of this disease is contained in Bureau Circular 51.

AUTOPSIES ON WILD ANIMALS.

A large number of interesting pathological conditions were found in the wild animals furnished by the National Zoological Park. The different species of wild animals which are kept in captivity living under unnatural conditions are more susceptible to the various diseases than those which live continually in localities and under conditions to which their systems are accustomed. Lack of exercise and changed climatic conditions are especially important factors in making the animals in captivity susceptible to affections of the respiratory and digestive tracts. The results of the autopsies show that the majority of animals succumbed to disorders of this kind. The Pathological Division received for autopsy 126 animals from the National Zoological Park, and the results of the post-mortem examinations are as follows:

Diseases of the digestive apparatus, 36, as follows: Liver, 4 (cirrhosis, 1; fatty degeneration, 2; necrosis, 1); gastro-intestinal tract, 32 (gastritis, 2; chronic gastritis, 1; gastro-enteritis, 4; rupture of the rumen, 1; enteritis, 10; diffuse peritonitis, 1; septic peritonitis, 1; infectious entero-hepatitis, 1; colitis, 1; gangrenous intestines, 1; intussusception, 2; intestinal parasites, 4; hemorrhagic peritonitis, 1; stomatitis, 1; esophagus obstruction, 1).

The gastro-intestinal and respiratory tracts were involved together in two cases (pulmonary congestion and enteritis, 1; pneumonia and enteritis, 1).

Diseases of the respiratory tract, 16 (pneumonia, 6; pleurisy, 1; abscess of lung, 1; asphyxia, 2; pulmonary congestion, 3; parasites of lung—porocephalus, 3).

Diseases of the genito-urinary tract, 12 (parenchymatous nephritis, 7; hemorrhagic nephritis, 1; purulent nephritis, 1; septic metritis, 1; impaction of oviduct, 1; catarrhal salpingitis, 1).

Diseases of the circulatory apparatus, 2 (hypertrophy of the heart, 1; pericarditis, 1).

Diseases of the locomotory apparatus, 1 (arthritis).

Bacterial diseases were specificially demonstrated in the following cases: Tuberculosis, 20; hydrophilosis, 3; proteus bacillosis, 8; *Bacterium œrogenes*, 1, septicemia, 5; *Bacillus enteritidis*, 1; coli bacillosis, 1.

Mycotic diseases were found in 10 cases, all being aspergillosis (fumigatus).

Cases not diagnosed (failure due to decomposition and other unavoidable conditions), 5.

Traumatisms, 3 (fracture of ischium, 1; contusion of brain, 2).

QUAIL DISEASE.

In February and March a large number of dead bobwhites were received at the Pathological Division from different dealers. Post-mortem examination showed in all cases congestion of the lungs, focal necrosis of the liver, and intestinal ulceration. Careful inquiry

revealed the fact that quail in the United States were threatened with a virulent epizootic which might lead to as extensive destruction of these birds as had occurred in England and Scotland under the ravages of grouse disease. Centers of infection were located at Alexander City and Dadeville, Tallapoosa County, and Birmingham, Jefferson County, Ala.; Wichita, Kans., and Marlow, Chickasaw Nation, Ind. T. The fact that a virulent *Bacillus coli* was found to be the cause of the disease indicated its close resemblance to grouse disease. Since the pathologic features of British grouse disease, however, are not altogether like those of the disease among American quail, it was deemed well to allow the disease in this country to go by the popular name of quail disease. A Bureau circular (No. 109) was published as a preliminary report, embodying questions to be answered by persons interested in the propagation of this popular game bird. To these questions of the circular have come numerous responses showing that the disease is more widespread than was shown by the original investigation, and demonstrating also that the Bureau was not too early in promulgating whatever facts had come to hand through field investigation and laboratory research.

THE MALTESE GOAT IMPORTATION AND MALTA FEVER.

The remaining Malta goats and their offspring from the importation of September, 1905, have been kept in quarantine during the past year. The climatic conditions of this country do not appear to be favorable to the breeding of these animals, and all of the offspring have been delicate, a large proportion dying from rheumatism, goiter, or pneumonia.

From time to time agglutination tests were made with the blood of the goats, and as late as June, 1907, when the last test was made with the serum from the 16 remaining animals, two positive reactions were obtained. From the results of the investigation of Malta fever by the commission on Mediterranean fever of the Royal Society of London and the measures it has adopted to prevent the spread of the disease in the island of Malta, it was deemed inadvisable to risk using these animals for the purpose for which they were originally imported. The remainder of the herd have therefore been destroyed.

NECROTIC DERMATITIS IN SHEEP.

During the past winter this disease broke out in a number of bands of sheep in Montana and rapidly spread, affecting a great many animals. It was confined principally to the face and head and occasionally the feet. The lesions consisted of patches varying in size from one-fourth to three-fourths of an inch in diameter, devoid of wool, and covered with thick, dry, brown crusts which, when forcibly removed, exposed a granulating base covered with pus. Three live

animals affected with the disease were forwarded to the laboratory, from which cases the *Bacillus necrophorus* was isolated.

In March a similar outbreak occurred in a flock of about 150 sheep and lambs at The Plains, Va., which was investigated by the Bureau. The adult animals were affected before they commenced to lamb, and the udders showed lesions of the disease. As the lambs were born they rapidly became infected, the lesions appearing about the head and on the legs as irregular granulations, which projected above the surface and in some cases were pedunculated. There were no lesions in the mouth. Cultures made from these cases also developed *Bacillus necrophorus.*

The disease runs a mild course in the majority of cases, and even in the severest forms it rarely causes death. Treatment with antiseptic washes and ointments usually effects a speedy cure.

MESENTERIC EMPHYSEMA OR INTESTINAL GAS CYSTS IN HOGS.

The study of this quite common affection of hogs was taken up by the Pathological Division during the past year, in order to establish the cause of this peculiar condition. While the affection is not of great importance from an economic standpoint, its occurrence in apparently healthy hogs, and the extensive cystic formations in the intestinal walls and on the mesentery, make this condition of great interest from a pathological standpoint.

Numerous fresh specimens were received from several abattoirs, and various culture media were inoculated. The pathological histology was also carefully studied. A micro-organism similar to the one recently described by Jaeger in this condition and belonging to the coli group was obtained from every case examined and was found to be the etiological factor of this process. The affection invariably restricts itself to the small intestines and takes its origin in the mucous membranes. The cysts are always found in the course of the lymphatics, and there is a close association between these cysts and the lymph vessels. Histologically the lymphatics, principally, manifest marked changes and the picture is very striking. Masses of giant cells are found frequently obstructing the entire lymph vessel, and again they may form a uniform lining of the gas cysts. Their presence excludes the theory that the affection is of an acute character, and, on the contrary, is indicative of a chronic condition. The experiments are still in progress, and attempts to transmit the condition by the introduction of the isolated organisms in various ways have not yet been concluded.

URTICARIA IN HOGS.

Affections of the skin in hogs are very common; and as some of the skin lesions are frequently associated with infectious diseases, a thorough knowledge of the various cutaneous affections is of great

importance from the standpoint of a differential diagnosis. A very frequent affection of the skin in hogs is urticaria (diamond skin disease, rash, etc.); and as the lesions closely resemble those of swine erysipelas of foreign countries, this condition of the skin was carefully studied as to its etiology and pathology. It was found that urticaria in hogs is merely a localized affection of the skin in which a bacterial invasion plays no part. The cutaneous symptoms may result from various causes; thermic influences on the skin, irritants, certain drugs, and gastro-intestinal disorders may produce the characteristic rash of urticaria. In most of the cases in hogs it is brought on by a gastro-intestinal catarrh with the subsequent action of the absorbed fermenting toxins upon the walls of the blood vessels. The condition may be classified as a mild inflammatory exudative process in which the pathogenesis is identical with that of any other inflammation. It is produced by a direct influence of the cause on the wall of the vessel, and not through the influence of the central nervous system, as has been formerly supposed. An article on this subject is now being prepared for publication.

CORN COCKLE POISONING OF CHICKENS.

The Pathological Division investigated the loss of about 120 chickens by two men who at the suggestion of a friend bought what they supposed to be wheat middlings, with which to make an evening mash for their poultry. Both men secured from a near-by dealer what he offered as a first grade of middlings, but which proved to be only low-grade screenings heavily loaded with corn cockle (*Agrostemma githago*). The most important lesion was that of a severe corrosive action upon the whole gastro-intestinal tract, particularly the crop. Intestinal hemorrhages were quite marked in several of the cases. Many a farmer would be inclined to doubt a diagnosis of poisoning from cockle in such cases, claiming that he had fed lots of cockle with his wheat to his chickens. In fact, that would be the very use to which he would be likely to put wheat that had become badly infested with cockle. It is, indeed, true that the poisoning of chickens by cockle seed fed with wheat is rarely, if ever, heard of. But when the grain has been ground there is then exposed the tissue of the seed which contains the sapotoxin, the poisonous material which has in numerous instances proved so fatal to poultry, and even to larger animals.

FOWL CHOLERA.

Another important chicken disease definitely located during the past year was fowl cholera. It is true that almost every raiser of chickens reports serious outbreaks of chicken cholera, and in many instances also reports the cure of his sick birds by some home remedy

or some change in feeding. But it is also true that in none of these cases is the diagnosis based on anything more than the presence of a fatal diarrhea. The small number of birds lost, the cure of the sick birds, and the method of cure all testify to the incorrectness of this diagnosis. When true fowl cholera (hemorrhagic septicemia) is once introduced into a flock it is sure to decimate that flock unless speedily recognized and promptly treated by thoroughgoing disinfection.

In April, 1907, the Pathological Division received the viscera of some dead fowls from a poultryman in Clay County, Ill. He reported hens going to the nest apparently well and falling over dead in the morning. From the tissues was recovered *Bacterium aviseptiicum*, the causative agent of hemorrhagic septicemia in fowls. This fulminant form of the disease has been reported but two or three times in America, although it is possible that true fowl cholera, a subacute form of hemorrhagic septicemia, due to a less virulent variant of the causative organism, is more or less common.

In view of the fact that the fowl-cholera organism is closely related to, if not identical with, the bacterium of swine plague, the following case is particularly interesting: In response to a request from a farmer for aid in the diagnosis of a disease which was taking off his poultry, this division made an examination of two dead chickens forwarded from Centerville, Miss. The special lesions noted were enlarged and congested liver studded with petechial hemorrhages and enlarged spleen greatly congested. From the organs were isolated motile organisms which by tinctorial and cultural tests, confirmed by pathogenicity, were proved to be virulent members of the hog-cholera group of bacilli. The finding of the hog-cholera bacillus in the latter case is an addition to the records of last year, when this division reported the finding of *Bacillus enteritidis* in a duck and two pigeons.

HEMORRHAGIC SEPTICEMIA OF PIGEONS.

A disease identical with fowl cholera is that known as hemorrhagic septicemia of pigeons. There was brought to the laboratory for examination the last of a loft of 35 pigeons, all of which had died with similar symptoms following the introduction of a few birds bought in the market. Bacteriological examination showed the presence in the blood and all the organs of a minute, nonmotile, polar-stained organism, which was proved by further investigation to be a member of the swine-plague group of bacteria and resembled closely the organism reported by Leclainche as the cause of hemorrhagic septicemia in wild pigeons. Inoculation of pure cultures demonstrated its intense virulence. This is the first time that this disease has been reported in this country among pigeons. The fact that it was introduced by the purchase of a few birds in the market empha-

sizes the great danger, so often pointed out. of introducing new stock without several days of quarantine.

DISTRIBUTION OF BLACKLEG VACCINE.

During the year ending June 30, 1907, there were made in the Pathological Division for free distribution about 1,250,000 doses of blackleg vaccine, consisting of 67 separate makings.

This vaccine is used for the purpose of conferring immunity on young cattle against the disease known as symptomatic anthrax, or, more popularly, blackleg. The manufacture of this vaccine continues to be an important feature of the routine work of the laboratory, the vaccine being in great demand by stock owners in infected districts. The process of manufacture of this product has been greatly improved during the past year.

The results of vaccinations for the year ending June 30, 1906, as reported to the Bureau by the stock raisers who have used vaccine, are as follows:

Results obtained from vaccine distributed during the fiscal year ended June 30, 1906.

State or Territory.	Number of reports.	Number of cattle vaccinated.	Deaths, same season, previous to vaccination.		Died after vaccination.					
			Number.	Per cent.	Within 48 hours.	From 2 to 7 days after.	Within 1 year.	Total number.	Per cent of deaths after vaccination.	Number of cases due to mistakes.
Arkansas	14	870	18	2.06	.....	3	.....	3	0.34	.....
Arizona	45	4,060	176	4.33	2	9	5	16	.39	3
California	403	60,021	559	.93	5	33	190	228	.38	1
Colorado	469	60,494	947	1.53	29	69	180	278	.45	.....
Georgia	1	13	6	46.15	.....	.....	.....	.....	.....	.....
Idaho	29	2,818	39	1.38	2	1	1	4	.14	.....
Illinois	93	3,738	103	2.75	4	1	14	19	.50	.....
Indiana	8	376	9	2.39	.....	3	1	4	1.07	.....
Indian Territory	24	1,907	53	2.77	.....	1	6	7	.36	.....
Iowa	161	7,768	130	1.67	3	7	43	53	.68	.....
Kansas	444	38,400	524	1.36	12	40	108	160	.....	5
Kentucky	4	174	3	1.72	.....	.....	.....	.....	.....	.....
Louisiana	1	30	.....	.....	.....	.....	.....	.....	.....	.....
Michigan	2	18	.....	.....	.....	.....	.....	.....	.....	.....
Minnesota	17	674	21	3.11	1	.....	.....	1	.15	.....
Mississippi	1	70	7	10.00	.....	.....	2	2	2.85	.....
Missouri	381	13,821	202	1.46	9	19	42	70	.50	.....
Montana	263	33,584	337	1.00	8	27	45	80	.23	3
Nebraska	1,335	103,537	1,920	1.85	44	172	306	522	.50	27
New York	12	304	12	3.94	.....	1	1	2	.65	.....
North Carolina	54	2,318	80	3.43	3	2	5	10	.43	.....
Nevada	7	2,184	30	1.37	.....	1	7	8	.36	.....
New Hampshire	1	12	.....	.....	.....	.....	.....	.....	.....	.....
New Mexico	42	9,494	331	3.48	2	22	11	35	.36	14
North Dakota	355	36,791	568	1.54	12	20	100	142	.38	.....
Ohio	2	36	.....	.....	.....	.....	.....	.....	.....	.....
Oklahoma	41	5,427	82	1.51	1	8	16	25	.46	1
Pennsylvania	1	8	1	12.50	.....	.....	.....	.....	.....	.....
Oregon	61	12,723	105	.82	1	4	9	14	.11	6
South Dakota	401	39,147	565	1.44	25	64	177	266	.67	3
Tennessee	51	1,952	48	2.45	.....	2	13	15	.76	1
Texas	770	171,143	2,364	1.38	24	167	1,035	1,226	.71	35
Utah	14	2,291	18	.78	.....	2	1	3	.13	.....
Vermont	5	86	1	1.16	.....	.....	.....	.....	.....	.....
Virginia	296	9,070	228	2.51	4	14	36	54	.59	.....
Washington	40	1,367	62	4.60	1	.....	15	16	1.17	.....
West Virginia	104	2,695	60	2.22	1	7	16	24	.89	.....
Wisconsin	7	411	2	.48	.....	.....	.....	.....	.....	.....
Wyoming	334	64,846	664	1.02	20	85	164	269	.41	3
Total	6,292	691,557	10,276	1.485	203	794	2,549	3,546	.514	102

An examination of the foregoing table shows, when compared with the records of previous years, a slight decrease in the percentage of animals dying without being vaccinated, also in the number of animals dying subsequent to vaccination. It therefore appears justifiable to reiterate a former statement that blackleg is becoming much less of a menace to the raising of young cattle than it was some years ago, when the mortality without vaccination amounted to over 10 per cent in certain sections. It is evident that the vaccine in a few years has not only saved many animals to the breeder, but has gone far toward a goal that was suggested early in the period of free vaccine distribution, i. e., the eradication of blackleg from the pastures of the country.

WORK OF THE BIOCHEMIC DIVISION.

This division, of which Dr. M. Dorset is chief, has been engaged during the year chiefly in the laboratory inspection of meat products, investigations concerning hog cholera, and tests of stock dips, besides continuing the preparation and distribution of tuberculin and mallein.

LABORATORY MEAT INSPECTION.

In addition to the lines of work previously carried on, this division has taken up the laboratory inspection of meats and meat food products under the provisions of the act of Congress of June 30, 1906. This work involves the inspection of prepared meats and meat food products manufactured in establishments at which inspection is conducted by the Bureau of Animal Industry, and requires the examination of all substances entering into the composition of these products, including salt, pickles, spices, edible fats and oils, etc., in addition to the examination of the meats themselves, to determine their bacteriological and chemical condition. For carrying out this work laboratories were established in New York, Chicago, Cincinnati, Kansas City, Omaha, and San Francisco. All of these laboratories, with the exception of the one located in New York City, were equipped and ready for work prior to October 1, 1906. About March 1, 1907, the laboratory located in Cincinnati was transferred to East St. Louis, Ill.

These laboratories, working in connection with the Washington central laboratory, inspected samples of all meat food products which were prepared prior to October 1, 1906, and which, under the regulations of the Department, required a laboratory inspection before they could be shipped interstate. This inspection resulted in the refusal of the Department to permit shipment in interstate commerce of more than 100 different varieties of meat food products which

were found to be in conflict with the regulations and which had previously been allowed shipment in interstate commerce without restriction. In addition to this inspection of stocks on hand prior to October 1, a regular inspection of the products prepared in various establishments granted inspection or exemption was taken up on that date, and several thousand samples have since been examined. These examinations show that as a general rule the packing houses have been complying with the regulations with regard to preservatives and coloring matters and also with regard to proper labeling.

In connection with the meat-inspection work, an ink has been devised for the marking of inspected carcasses which appears to give satisfactory results when properly applied. If experience shows that this ink is as satisfactory as results so far indicate, its use will effect a great saving in the cost of marking inspected carcasses.

INVESTIGATIONS CONCERNING SOURING AND OTHER CHANGES IN MEATS.

Experiments are under way concerning the cause of souring of meat and the changes which may take place in canned meat food products. This work involves experiments with hams taken from hogs exhibiting various diseased conditions, or other conditions, such as overheating, which are believed to affect the curing of meats, and also includes bacteriological examinations of sweet and sour hams and ham pickles. Along with these experiments concerning sour meats investigations are being carried out with regard to the bacteriological condition of normal canned meats and of canned meats which have undergone various changes.

HOG CHOLERA EXPERIMENTS.

The experiments concerning the etiology of hog cholera, which were described in the previous annual report, have been continued, but not as extensively as in previous years. So far as they have gone, however, they confirm in all particulars the findings which were briefly described in last year's report.

PREVENTION OF HOG CHOLERA BY VACCINATION.

The method of immunizing hogs from hog cholera, concerning which preliminary reports were submitted last year, has been tested much more extensively than heretofore, and the following facts have been demonstrated:

(1) When hogs immune from hog cholera are injected with suitable amounts of virulent blood taken from hogs sick of the disease, the blood of the immunes acquires the power to protect nonimmune hogs from an otherwise fatal dose of disease-producing blood administered simultaneously with the serum.

(2) Immunes which have never exhibited symptoms of disease after exposure to hog cholera may furnish equally as potent serum as those which have recovered from an attack of the disease.

(3) Hyperimmunization may be accomplished as well by administering one large dose of disease-producing blood to an immune as by repeated injections of smaller doses.

(4) Hyperimmunization may be accomplished with blood from any virulent strain of hog cholera.

(5) Hyperimmunized hogs probably retain for several months the power to furnish a potent serum.

(6) Serum from properly hyperimmunized hogs in doses of 15 c. c. should protect nonimmunes weighing from 25 to 50 pounds from a fatal dose of disease-producing blood administered simultaneously with the serum.

(7) Immunity in hogs treated by what is termed the serum-simultaneous method (No. 6) lasts at least three and one-half months and probably longer.

(8) In serum-simultaneous vaccination it is not necessary to produce illness in the vaccinated hog in order to secure an immunity lasting for at least three months.

(9) If a sufficient dose of serum is given, hogs are not injured by the serum-simultaneous vaccination.

(10) Hogs vaccinated by the serum-simultaneous method do not communicate disease to others unless they themselves become sick.

(11) Serum administered alone can not be expected to furnish protection for a longer period than three weeks.

(12) The serum probably can not be used successfully as a curative agent unless administered within four days after actual infection has taken place.

In order that this method, which has proven so successful in an experimental way, may be given a practical test, efforts will be made to secure the cooperation of experiment stations in testing serum which the Department will furnish them. If arrangements for these tests can be made it is hoped that the practicability of this method for combating hog cholera may be determined within a short time.

PREVENTION OF HOG CHOLERA BY SELECTIVE BREEDING.

This work has been continued and another generation of hogs from immune parents has been exposed to hog cholera. The results were not decisive, and the work will be continued along the lines described in the preceding report.

BACTERIOLYTIC POWER OF BLOOD SERUM FROM HOGS.

Experiments designed to determine the effect of the blood serum of hogs upon various bacteria which at times attack these animals have been carried out. These experiments are of a very technical nature and are of interest on account of the light they throw upon the defensive mechanism of the animal body in its fight against infectious diseases. Bulletin 95, by Dr. B. M. Bolton, describing the results of these experiments, was issued during the year. The details of this work, on account of their technical nature, need not be gone into in this report.

PREPARATION AND DISTRIBUTION OF TUBERCULIN.

Experiments having for their object the development of a practical method of standardizing tuberculin have been begun, but sufficient progress has not been made to warrant a statement as to the results which may be expected from them.

Requests for tuberculin from official veterinarians and health officers throughout the country for the diagnosis of tuberculosis in cattle continue to increase. The total amount of tuberculin prepared and shipped to such officers and to Bureau employees during the past fiscal year amounted to 129,050 doses, an increase of 24 per cent over the amount distributed during the previous fiscal year.

PREPARATION AND DISTRIBUTION OF MALLEIN.

During the fiscal year the demand for mallein for the diagnosis of glanders in horses was greatly in excess of that during the previous fiscal year, 41,012 doses having been furnished to health officers and to the War Department.

The quantity supplied to the War Department amounted to 25,507 doses, this being used in part to test all of the horses belonging to that Department and in part for the purpose of determining the immunization and curative value of mallein.

Recent experiments have been planned looking to the immunization of horses from glanders by artificial inoculation, but these experiments have not progressed sufficiently to warrant a report upon them.

STOCK DIPS.

As a result of the laboratory experiments conducted in the Biochemic Division and of the field tests conducted by that division in collaboration with the Zoological Division and the South Dakota Agricultural Experiment Station, permission has been granted by the Secretary of Agriculture for the use of cresol dips and coal-tar creosote dips in the official dipping of sheep for scabies, thus mak-

ing available four classes of dips which may be used in the official dipping of sheep, the other two, previously sanctioned, being the lime-and-sulphur and tobacco-and-sulphur dips. Since the issuance of the order of the Secretary permitting the use of cresol dips and coal-tar creosote dips a large number of proprietary substances belonging to these classes, as well as others belonging to the classes of lime-and-sulphur and tobacco-and-sulphur dips, have been submitted to the Bureau for the purpose of determining the strength in which they may be used for official dipping, and as a result of these laboratory examinations permission has been granted for the use in official dipping of the preparations which were found to conform to the prescribed standard.

The Biochemic Division has also examined samples of crude petroleum to determine their fitness for dipping cattle for scabies and for ticks, and has conducted some further experiments in regard to methods of emulsifying these dips.

DISINFECTION AND DISINFECTANTS.

The experiments which were intended to determine the relative value of liquor cresolis compositus (U. S. P.) and carbolic acid as disinfectants have been completed, and they show that the former has a distinctly greater germicidal value than carbolic acid. The results of these experiments are contained in Bureau Bulletin 100, by Dr. C. N. McBryde. Experiments with other coal-tar products are being carried on in a similar manner.

DIGESTION EXPERIMENTS WITH POULTRY.

The analytical work in connection with the second series of digestion experiments with poultry has been completed and a bulletin describing these experiments has been prepared for publication. These experiments have a practical bearing upon chicken feeding.

EXAMINATION OF WATER SUPPLIES OF DAIRY FARMS.

Complete bacteriological and chemical analyses, together with a sanitary survey of the surroundings, of the water supplies of approximately 400 dairies located in Virginia, Maryland, and the District of Columbia have been recently completed, but the results have not as yet been brought together in such shape that it is possible to report at this time upon the conditions found.

WORK OF THE DIVISION OF ZOOLOGY.

This division, under Mr. B. H. Ransom as chief, has continued and extended its work of investigating animal diseases of parasitic origin, collecting and determining animal parasites, and preparing publications relating to these subjects.

ROUNDWORMS IN SHEEP.

The first series of field experiments in connection with a study of the life history of the roundworms of sheep with the view of determining, if possible, methods of preventing infection has been completed. From these experiments the following conclusions may be drawn:

Lambs from infested ewes will remain free from hook worms (*Monodontus trigoncephalus*) if separated from their mothers soon after birth, and afterwards allowed with them in a clean pen only during short periods for sucking, the manure being removed from this pen each time it is used, and if the lambs when weaned are placed by themselves on noninfested pasture.

Infection with twisted stomach worms (*Hæmonchus contortus*) may be almost entirely avoided by this method.

Lambs raised by this method will rarely altogether escape infection with nodular worms (*Œsophagostomum columbianum*); usually they will escape with a light infection, and in a few instances they may become rather heavily infested.

The "bare-lot" method of Dalrymple (raising lambs and ewes together in a perfectly bare lot and feeding and watering from raised racks and troughs) does not protect lambs from a rather heavy infection with stomach worms.

In some cases infection with hook worms may not occur in lambs raised by the "bare-lot" method.

With the "bare-lot" method some lambs may escape infection with nodular worms, but in most cases a slight infection will occur, and occasionally a rather heavy infection may take place.

Sheep infested with stomach worms, hook worms, and nodular worms, if kept on a clean board floor and supplied with clean fodder and water (the chances of reinfection thus being reduced to a minimum), will still be more or less infested with these parasites after a lapse of nearly twenty months, indicating that individuals of these parasites may live in the body at least this length of time. No increase in the number of individuals of the parasites occurs in the body when sheep are kept under these conditions; on the other hand the number decreases, showing that the eggs of the parasites will not develop to maturity inside the body, but must first pass to the outer world before reinfection is possible.

Pastures on which infested sheep have grazed will not become free from infection with twisted stomach worms after remaining empty from October 25 to June 16, climatic conditions being those of Washington, D. C., in the years 1906 and 1907.

Pastures on which infested sheep have grazed will be free from infection with hook worms and nodular worms after remaining empty

from October 25 to June 16, climatic conditions being those of Washington, D. C., in the years 1906 and 1907.

A second series of field experiments undertaken this year (1907) has been a failure on account of the death while quite young of nearly all the lambs which were to be used.

The laboratory experiments bearing on the life history of the twisted stomach worm have been continued, and although this work has been much interrupted some new data of importance in addition to those published in Circular 93 have been obtained. A circular (No. 102) containing information as to the treatment and prevention of stomach-worm disease in sheep has been issued.

Experiments with *Strongyloides longus*, a rather common intestinal roundworm of sheep, closely related to the parasite found in cases of Cochin China diarrhea in man, have shown that rabbits may be infected with this parasite either by feeding them with embryos which have developed to the proper stage in cultures of feces from infested sheep or by placing cultures containing the embryos on the skin. These facts indicate that sheep also may become infected with the parasite in question either through the swallowing of embryos or by their penetration through the skin.

A circular describing three new genera and several new species of strongyloid nematodes found in sheep and other ruminants has been prepared and is nearly ready for publication.[a] This circular will be of value in assisting investigators to properly differentiate species which have heretofore been greatly confused.

GID IN SHEEP.

An investigation of the distribution of the gid parasite in the State of Montana has been continued, and up to the present time the fact of its presence in Teton, Chouteau, Valley, Fergus, Broadwater, and Cascade counties has been definitely established, and considerable losses among sheep from this cause have been reported. These counties cover a large part of the State, showing that the disease is widely prevalent in Montana, and the indication are that it has even a wider distribution than has been definitely determined.

Experiments for the purpose of determining certain facts in the life history of the parasite are in progress, sheep affected with the parasite having been obtained and shipped to the laboratory for this purpose. A careful morphological study of the adult and larval stages of the parasite has been begun in order to fix more definitely the points of difference between the gid tapeworm and other closely related tapeworms of dogs, the latter of which are in no way con-

[a] Since issued as Circular 116.

nected with the gid parasite, but are likely to be mistaken for it. In this connection a comparison is being made between specimens of gid parasites of American and European origin in order to determine whether the two are of the same or of different species.

"PALISADE-WORM" DISEASE OF HORSES.

A preliminary investigation of this disease, which has been attributed to the palisade worm (a parasitic nematode, certain stages of which occur in the arteries in the neighborhood of the celiac axis, producing aneurisms), has been made. From the data gathered it is not possible to state whether or not the parasite in question stands in a causal relation to the disease which is associated with it. A large number of horses are annually lost from this disease in Wyoming and neighboring States, and the matter is sufficiently important to warrant an extensive investigation.

TREATMENT OF SHEEP SCAB.

Two series of experiments in the treatment of sheep scab, with special reference to the use of coal-tar dips, carried on under cooperation between the Biochemic and Zoological divisions, have been completed. As a result of these experiments the use of coal-tar dips under certain restrictions is now permitted in the dipping of sheep entering interstate commerce. This work is reported more at length in connection with the work of the Biochemic Division.

INVESTIGATIONS BEARING ON TICK ERADICATION.

A series of investigations with the object of improving, if possible, methods now in use in tick eradication, and determining other methods which may prove useful, has been undertaken at Auburn, Ala., with the cooperation of the Alabama Agricultural Experiment Station and the live-stock sanitary board.

COLLECTION OF PARASITES.

At the laboratory post-mortem examinations with reference to the presence of parasites have been made of 136 animals. Of these, 70 were wild animals, mostly from the National Zoological Park, and the remainder were domestic animals. Seven of the latter were free from parasitic infection, and in the 59 found to be infested parasites occurred as follows: Cestodes in 9, nematodes in 58, protozoa in 14, trematodes in 1. Twenty-five of the wild animals were free from parasites, and parasites occurred in the remaining 45 as follows: Cestodes in 15, nematodes in 38, protozoa in 3, trematodes in 13, arthropods in 5.

In addition to the specimens from the animals examined at the laboratory a considerable number sent in for identification and others obtained by exchange with various investigators at home and abroad have been added to the collection. The total number of entries in the catalogue of the helminthological collection is now 4,794.

INDEX-CATALOGUE OF MEDICAL AND VETERINARY ZOOLOGY.

Work on this publication has been continued, four parts having been issued and two more sent to the printer during the fiscal year. Nineteen parts, comprising 1,492 pages, have been prepared so far, bringing the work down through the M authors.

WORK OF THE BUREAU EXPERIMENT STATION.

During the past year the work at the Bureau Experiment Station, as in former years, has consisted of both independent original investigations and investigations in cooperation with the other scientific divisions of the Bureau, relating to animal diseases and breeding. The station is located at Bethesda, Md., and is in charge of Dr. E. C. Schroeder, superintendent.

TUBERCULOSIS.

Two bulletins on tuberculosis were published in the course of the year, Nos. 93 and 99, based on observation and experiments made at the station. In these special attention was called to the danger of infection through the ingestion of contaminated food rather than through the respiration of air in which dust containing tubercle bacilli is suspended. It was shown that the location of tuberculous lesions in the body is quite independent of the point at which the infectious material enters, and that the frequency with which tuberculosis occurs as a lung disease does not justify the conclusion that the lung is infected directly through the air. The frequency with which the disease localizes itself in the lung was traced to the following facts: That tubercle bacilli may pass through the uninjured wall of the intestine after they have been swallowed and then into the lymph channels; that they are carried along the lymph channels and are passed into the blood through the great lymph ducts that communicate with the venous circulation, and that the blood after it has received the lymph stream is filtered through the exceedingly fine capillary network of the lungs before it is distributed to other portions of the body.

The work of the year demonstrated that the commonest mode for the discharge of tubercle bacilli from the bodies of tuberculous cows is with their feces; that about 40 per cent of the tuberculous cows that show no symptoms of disease are expelling and scattering tuber-

cle bacilli, and that tubercle bacilli passed with the feces of tuberculous cows are actively pathogenic.

It was shown that when tubercle bacilli are present in milk they will be present in both the skim milk and the cream obtained from the milk, irrespective of the manner in which the cream rises—slowly and naturally by standing or rapidly through a rotary or centrifugal process. Butter made from infected milk was shown to be infectious for guinea pigs, and it was shown that tubercle bacilli in ordinary salted butter persist forty-nine days with undiminished virulence.

When it is borne in mind how frequently milk contains cow feces, and that the percentage of dairy cows known to be tuberculous is very large, the facts presented seem to warrant the conclusion that tuberculous cows are responsible in a great measure for the prevalence of tuberculosis in the human family.

The investigations to explain the increase of tuberculosis observed in recent years among hogs, which were begun last year, are still in progress. It was shown that the simple exposure of hogs to the manure from a stable containing tuberculous cows is sufficient to infect them in comparatively short time. The Pathological Division is making further investigations at the Experiment Station relative to the danger of tuberculosis among pigs when infected sows are used as brood animals. Additional work during the year with the application of the tuberculin test to hogs has given results confirmatory of the conclusions published last year in Bureau Bulletin 88.

Through the use of a cow with a tuberculous udder it was found that calves taking milk from such cows contract tuberculosis with great rapidity. One calf that took the milk of the cow for several months was affected with generalized tuberculosis at the age of 5 months, and four calves, of which three sucked the milk from the cow's udder, respectively one, three, and seven days, and one which was fed the milk from a pail thirty days, also contracted tuberculosis.

In cooperation with the Pathological Division a series of special experiments with tuberculosis is being conducted, among which the more important are tests of various methods of immunization, the curative treatment of tuberculosis, and a study of the relative virulence of tubercle germs derived from different portions of the body of a tuberculous animal. In connection with the latter it is interesting to know that tuberculosis was induced in the bodies of guinea pigs by the inoculation of the feces from a tuberculous cow; that pure cultures were obtained in the Pathological Division from such guinea pigs, and that cows have been injected with the pure cultures. Some of the cows injected have the appearance of animals affected with a fairly rapid form of tuberculosis.

RABIES.

Among the several cases of rabies brought to the notice of the station in the course of the year were two of special interest, as they occurred in other animals than dogs. In the fall of 1906 a small, quiet mare was placed in quarantine because she had been bitten by a rabid dog. Fourteen days after her confinement in a large, well-ventilated box stall she showed symptoms of the disease and died after suffering terrible agony. Rabbits inoculated from the mare also became rabid.

In the spring two horses and a cow owned by neighboring farmers were placed in quarantine, because they had been bitten by a rabid dog. The horses have not shown symptoms of disease, but are still in confinement. The cow became rabid on the twenty-second day after she was bitten and was killed to end her agony, with the consent of her owner, after he had convinced himself that she was truly "mad." About a week before she became rabid she produced a calf, which she failed to recognize during her paroxysms of fury and attacked viciously. The history of the dog that bit the two horses and the cow illustrates the great damage a rabid dog may do and the large territory he may cover after he has become affected, the farms where he bit the horses and the cow being located 9 or 10 miles from the premises from which the dog escaped. This dog is also known to have bitten four other dogs, which were at once killed by their owners.

OTHER INVESTIGATIONS OF DISEASES.

Investigations relative to infectious abortion, sheep scab, internal parasites of sheep, Texas fever, etc., are in progress in cooperation with the Bureau laboratories in the city. A test made of the infectious character of ticks grown on East India cattle has so far given negative results. The test of cattle ticks grown on sheep and other animals has progressed very slowly because material for the work has been difficult to obtain.

It was found from the examination of young turkeys raised near the station that the destructive disease known as blackhead exists in that locality, and the disease was also found in turkeys shipped to the Washington market from Virginia. From what can be learned it now prevails in most of the Eastern States and many outbreaks have occurred in the Western States. The rapidity with which it kills young turkeys was shown by the death of 26 out of 28 turkeys hatched at the station last spring. The two remaining birds are in poor condition and will either die or fail to reach a profitable maturity if they live. This disease is of great economic importance, and further investigations are projected.

THE TUBERCULIN TEST.

A number of cows owned by persons residing near the station were tested with tuberculin in the course of the year. The total number of tuberculin tests made at the station each year is quite large, and includes both hogs and cattle. The results obtained with the tests are exceptionally reliable, as shown by post-mortem examinations which are sooner or later made in the majority of cases.

Tests of commercial tuberculin have shown that some of this material found on the market is impotent and worthless. Some of the samples tested, which had the proper color and the general appearance of tuberculin, failed to cause a reaction in several cows that reacted strongly less than forty-eight hours later upon injection with tuberculin prepared in the Bureau laboratories. It is easy to understand that persons who have had unsatisfactory experience with unreliable tuberculin may have formed erroneous ideas as to the diagnostic value of the tuberculin test, but this, of course, does not affect the reliability of real tuberculin properly prepared. These tests will be continued, and when impotent products are found the results will be published.

OTHER WORK OF THE EXPERIMENT STATION.

Special investigations in animal breeding and feeding, in cooperation with the Animal Husbandry Office, are in progress at the Experiment Station. This work is discussed in connection with the work of the Animal Husbandry Office.

During the year the usual number of small experiment animals for the use of the station and the Bureau laboratories were raised, quite a number of local (mostly sporadic) outbreaks of disease were investigated, and all the station land not actually occupied by buildings, experiment pens, etc., was kept under cultivation to obtain green forage for the animals.

WORK OF THE ANIMAL HUSBANDRY OFFICE.

The work of this office, in charge of Mr. George M. Rommel, Animal Husbandman, consists principally of investigations concerning the breeding and feeding of farm animals and poultry.

HORSE BREEDING.

COLORADO WORK.

The work in the breeding of American carriage horses, in cooperation with the Colorado Experiment Station, is progressing satisfactorily. During the fiscal year 11 foals were dropped, 2 males and 9

females. The stallion Carmon served 15 mares owned by private individuals. No additional horses were purchased. One 2-year-old colt died of strangles or distemper.

VERMONT WORK.

The Morgan horse-breeding work of the Bureau has received a great impetus through the generosity of Mr. Joseph Battell, of Middlebury, Vt. Mr. Battell is known for his devotion to the Morgan horse and has from the first been greatly interested in the Bureau's work. Feeling that the importance of the work demanded more land than had been available, Mr. Battell offered to give the Department 280 acres of land within 2 miles of the village of Middlebury. The offer was accepted, and work was begun on the farm April 16, 1907. The land lies very well, the soil is good, and the location is excellent for a horse farm. Since his first gift, Mr. Battell has added 120 acres, making 400 in all. All the horses in the Vermont experiment have been transferred to the new farm at Middlebury, which has been named the Morgan Horse Farm. Although the main work is being done at the new farm, the project is still being carried on in cooperation with the Vermont Experiment Station.

No purchases of horses were made during the year, but arrangements were made to buy a stallion as soon as funds became available, which was done on July 1. The stallion, General Gates, is a particularly valuable acquisition. He was bred by Mr. Battell, and was sired by Denning Allen out of Sallie Scott, by a Thoroughbred. General Gates was selected on account of his individuality and his performance as a sire. He sired the champion Morgan stallion at the Louisiana Purchase Exposition and has made a great impression on the horse stock of central Vermont. Two of the fillies purchased in 1906 were sired by him. At the time General Gates was bought a yearling filly by him out of Ellen (one of the mares purchased in 1906) was also acquired.

On June 30, 1906, there were in the Vermont stud nine brood mares, one 2-year-old filly, two yearling fillies, six weanling fillies, and one weanling colt. During the spring four mares were bred to General Gates, two to Lambert, and one each to Battle Ax, Morgan, Falcon, and Rob Roy. One 2-year-old filly died August 8, 1906, from supposed heart failure, and one twin was lost June 9, 1907.

CLASSIFICATION FOR AMERICAN CARRIAGE HORSES.

Since the inauguration of the work of the Bureau of Animal Industry for the development from American material of a carriage horse which would breed true to type, it has been evident that one of the earliest supplementary steps to give the movement wide scope

and a broad foundation would be the establishment of classes for such horses at the State and National fairs. This sentiment has grown rapidly during the past year and has found expression in the addition of such classes to the premium lists of fairs in Iowa and Kentucky, States from which large numbers of American carriage horses are marketed. On their own initiative the Iowa State Fair, held at Des Moines, the Kentucky State Fair, held at Louisville, and the Blue Grass Fair, held at Lexington, Ky., have offered prizes for American carriage horses for the season of 1907.

The classifications adopted by these fairs are similar, but considerable differences exist which it is desirable to harmonize. A uniform, systematic, and practical classification, suitable for the guidance of fairs in general, is a possibility and will tend to bring about uniform exhibitions. If the horses shown under these conditions are capably judged, a uniform type can be fixed definitely and rapidly.

It seems fortunate that such a uniform classification has been made possible by a cooperative arrangement between the Bureau and the American Association of Trotting Horse Breeders. The classification was worked out by the committee on heavy harness horses of the association and was finally approved and distributed late in May, 1907. The committee is organized to represent the Department of Agriculture, the American Trotting Register Association, the American Saddle Horse Breeders' Association, and the American Morgan Register Association. Mr. George M. Rommel, the Animal Husbandman of the Bureau, is chairman of the committee, the other members being Mr. Joseph Battell, Middlebury, Vt., registrar of the American Morgan Register Association; Gen. John B. Castleman, Louisville, Ky., president of the American Saddle Horse Breeders' Association; Mr. A. T. Cole, of Wheaton, Ill., a prominent breeder of Morgan horses of carriage type; Prof. Charles F. Curtiss, director of the Iowa Agricultural Experiment Station, Ames, Iowa, and a member of the horse purchasing board of this Department, and Mr. H. K. Devereux, of Cleveland, Ohio, secretary of the American Association of Trotting Horse Breeders.

As soon as the classification was approved it was sent out to the horse press and to managers of fairs. It has had a most cordial reception. The press has quite generally approved the plan, and the interest of fairs has been very gratifying. Two fairs (the Interstate Fair held at Kansas City and the Kansas State Fair held at Hutchinson) have accepted the classification, and several others whose premium lists of 1907 were closed have signified a desire to take up the matter in time for the season of 1908. This start should be followed by its adoption generally, and wherever possible this should be done for the 1907 fairs.

The adoption of the classification by State fairs is especially urged for the reasons that they are in the closest touch with farmers, that the farmers are the breeders of most of the carriage horses sold on the American markets, and that the value of the American horse for carriage purposes is rarely appreciated by the farmers who breed them. Hundreds of horses sold annually by farmers at really insignificant prices are after some months of finishing and handling again sold as carriage horses at prices up into the thousands. Furthermore, there is a continual sale of stallions to supply this trade. These horses are usually of only moderate value as speed producers, but are of excellent carriage type. If kept entire and properly mated they could be of inestimable value as foundation sires of the American carriage horse, but as a rule they are castrated and lost so far as breeding value is concerned. If the powerful educational influence of the fairs and stock shows is thrown into the solution of the carriage-horse problem the farmer will not only be educated to appreciate the intrinsic value of the native light horse for carriage purposes, but will recognize the worth of the stallion with good conformation and quality but only moderate speed as a sire of carriage horses, and the problem of fixing the type will be one of early solution.

When a fair adopts the carriage-horse classification it should take all possible steps to insure a creditable exhibition of animals. By direct correspondence and by press and official notices farmers who own suitable horses should be urged to exhibit.

The classification has been published as Circular 113 of this Bureau.

SHEEP BREEDING.

One of the most important problems confronting stock breeders of the United States at present is the development of a breed of sheep suitable to range conditions. In spite of the great development and prosperity of the sheep industry of the West, breeding methods are not systematic, and most breeders are continually crossing, the result being a lack of uniformity in the stock and to a certain extent a failure to attain as high a standard as might otherwise be possible. The requirement of the range is a breed of sheep that will yield a profitable clip of wool, produce good mutton lambs, and that will stand flocking in large numbers. It is believed possible to combine these characteristics in one breed of sheep, and with this idea in mind an experiment was begun in the fall of 1906 in cooperation with the Wyoming Experiment Station. Fifty-nine ewes have been purchased in the northwestern range country and 30 in Nebraska for foundation stock. All were purebred or high-grade Rambouillet

except four, which were grade Delaines, and nearly all were yearlings and 2-year-olds. During the breeding season of 1906 rams were leased for breeding. In June, 1907, four purebred Rambouillet rams were purchased.

BREEDING OF MILKING SHORTHORNS.

Experiments in breeding milking Shorthorn cattle were begun in cooperation with the Minnesota Experiment Station and represent the first attempt the Bureau has made at cooperative breeding with a number of farmers. During the year steps were successfully taken to bring about the desired cooperation. Nine Minnesota breeders, most of them within easy touch of the station, have agreed to allow their herds to be used and to manage them according to the instructions of the Department and the station. These, with the station herd, will make 10 herds in all under observation.

POULTRY BREEDING.

The work in poultry breeding in cooperation with the Maine Experiment Station continues in a satisfactory manner. Three lines of investigation are being followed:

(1) To increase egg production. This work has been under way at the station for nine years, during three of which the Bureau has cooperated. At the start the better-laying hens were selected by their yearly records in trap nests and mated with the sons of heavy layers. The work has been continuous with each succeeding generation. This year 1,000 hens are kept for testing and breeding, and sufficient males to mate with them. Two thousand chicks are being raised from which to select next season's stock.

(2) Investigations regarding the yields and welfare of hens kept for egg production when kept in medium-sized and large flocks under similar conditions. Four flocks of 50 hens each are being compared with two flocks of 100 hens each. The floor allotment to each bird in all of the flocks is 4.8 square feet.

(3) Comparisons of the yields and the health of laying hens when kept in large and very large flocks in rooms of the same size. Four rooms each having 480 feet of floor space and alike in arrangement are used. One hundred hens are kept in each of the first two rooms, giving 4.8 square feet of floor to each bird. In each of the other rooms 150 hens are kept, the floor allotment there being 3.2 square feet. This is the third year during which the sizes of flocks and floor allotments have been investigated.

A careful description of the methods in use at the Maine Station was published as Bulletin 90 of the Bureau series.

OTHER BREEDING INVESTIGATIONS.

The animal-breeding experiments recently started at the Bureau Experiment Station are progressing favorably. Studies are being made of the effects of very close inbreeding of guinea pigs and domesticated rats. Experiments have been started with wild and domesticated rats to determine some of the laws of inheritance in breeding hybrids. Crossbreeding experiments are being made with sheep for the same purpose. Heredity of rats and guinea pigs is under observation, and selective breeding is also being carried on.

The question of telegony is receiving attention, and observations are made of the progeny of females that have previously produced hybrids. Although there are no experimental data to confirm the assertion that telegony plays a part in breeding, it is generally considered important by a great many breeders.

About 500 small animals are used in the breeding experiments at present, and careful records and descriptions are kept of each individual. Owing to the short time the experiments have been under way, no definite results can yet be stated.

FEEDING INVESTIGATIONS.

ANIMAL NUTRITION.

The experiments in animal nutrition in cooperation with the Pennsylvania Experiment Station during the fiscal year have consisted in a continuance of the investigation concerning the influence of age and individuality upon the metabolism of cattle, which was begun in the fall of 1904. Two steers have been used as the subjects of this investigation—one a purebred Aberdeen-Angus and the other of mixed breeding in which Jersey blood apparently predominated. The animals were purchased in 1904 as yearlings, and since that time have been fed identical feeds in amounts varying with the weight and capacity of the animals, while a complete record has been kept of the feed consumed and of the growth made. The record has included, in addition to the weights, monthly measurements of the animals and a systematic series of photographs every three months. At intervals of about three months also the digestibility of the feed has been determined and likewise the nitrogen balance, the results of the latter serving to indicate the rate at which lean meat was being produced by the animals. Furthermore, experiments have been made each winter with the respiration calorimeter to determine both the maintenance and the production values of the feeds used for each animal. In this way it is hoped to detect the influence, if any, of the advancing age of the animals and of their individuality, and to

determine whether either of those factors affects the actual physiological processes involved in the utilization of the feed.

In the course of the year, in addition to the records of feed and growth above mentioned, eight experiments have been made with the respiration calorimeter, together with a number of check tests to control the accuracy of the apparatus. This special work has required the taking of about 200 samples of feed and excreta, calling for a total of about 1,100 determinations in the chemical laboratory, some of which require special skill and experience. More than 1,000 weighings of animals, feed, and excreta were required, most of which must be accurate to within one-quarter of an ounce. The actual records of the calorimeter experiments required some 55,000 entries, exclusive of those relating to the samples and weights above mentioned. Naturally, such an amount of material necessitates a large amount of careful computation before the results can be deduced. This series of experiments has been concluded with this season's work, and the results are being prepared for publication. A bulletin upon the energy value of red-clover hay is now in press.

At the beginning of the new fiscal year, July 1, 1907, the work in animal nutrition was very materially enlarged by the addition of cooperative experiments in feeding beef cattle with the Missouri Experiment Station, this work having been carried on prior to that date by cooperation between the station and the Bureau of Plant Industry of this Department. The station is feeding a large number of steers to compare the results of feeding 2-year-olds and calves, and exhaustive investigations are planned on the feeding of steers from birth to maturity, chemical studies of the carcasses to be made from time to time. Representatives of different lots and ages will be sent to the Pennsylvania station with supplies of the same feed as they received at the Missouri station, and these steers will be placed in the respiration calorimeter for studies of their metabolism and of the energy values of the feed used.

FEEDING COTTON-SEED PRODUCTS TO HOGS.

A comprehensive study of the value of fermented cotton-seed meal for hogs is now under way, and it is proposed to undertake during the coming fiscal year experiments in feeding cotton-seed meal to hogs on alfalfa pasture. Varying amounts will be fed to determine the quantity which may be fed safely while hogs are on pasture.

POULTRY FEEDING.

Investigations with poultry were begun in the fall of 1906 at the quarantine station of the Bureau at Halethorp, Md. A three-pen poultry house was constructed of a size sufficient to accommodate 75 hens. On December 1, 75 White Plymouth Rock pullets were divided

into three equal lots and fed by the moist mash, dry mash, and hopper methods of feeding. The mixtures used were the same in all three pens, the difference being that the fowls in pen 1 received their mash moist, those in pen 2 received their mash dry, and those in pen 3 received both mash and grain mixtures from self-feeding hoppers. Records of production and of the general health and thrift of the hens in the various pens have been kept. During the spring chicks have been hatched from these hens and about 450 are now being raised. A careful record has been kept so that the pullets from the various pens can be identified, and this will be used during the coming year to repeat the experiment. It is planned to repeat it with several successive generations in order to determine the influence, if any, of the method of feeding upon vitality.

A new poultry equipment is in process of construction at the Bureau Experiment Station at Bethesda, Md. This site is far more favorable and convenient than that at Halethorp. The laying house now being built at Bethesda is 16 by 80 feet, divided into five pens, each 16 feet square, and has a small feed house attached. The house is so planned that more pens can be added as needed. A double-yard system for each pen is planned in connection with the laying house. The remainder of the tract devoted to poultry, about 5 acres in all, will be suitably fenced, so as to provide inclosures and range for the young stock. In addition to the laying house, five colony houses are to be built. It will also be necessary to construct a suitable incubator cellar.

BEEF PRODUCTION IN THE SOUTH.

The work in cooperation with Mr. Kernachan in the Tennessee Valley (northern Alabama), referred to in the previous report, has been continued during the year. The object of these experiments is to show what can be done under farming conditions in the way of improving the native cattle for beef purposes by using purebred bulls with grade cows and by proper feeding. There were 86 grade Aberdeen-Angus cattle under investigation at the close of the year.

The work in direct cooperation with the Alabama Experiment Station concerning the feeding of beef cattle comprised a feeding experiment during the winter of 1906–7, a repetition of those conducted during the two preceding winters. As usual, the steers were sold on the New Orleans market. The results of the three winters' work are being prepared for publication.[a]

SUPERVISION OF PEDIGREE RECORD ASSOCIATIONS.

Under the new system of supervising pedigree record associations less friction appears to have been experienced in the importation of animals for breeding purposes than ever before. The secretaries

[a] Since issued as Bulletin 103.

of such associations in the United States have cheerfully complied with the new regulations. One of the surest indications of the practicability of these regulations is the fact that, although they have been in force for one year, it has not been found necessary to make any changes in their terms. Some difficulty has been experienced in getting secretaries to use the exact form of entry certificates prescribed by the Treasury Department, but this is being rapidly and satisfactorily adjusted.

WORK OF THE DAIRY DIVISION.

The force of the Dairy Division, under Mr. Ed. H. Webster, chief, engaged in various lines of educational and research work, has been materially increased during the year. A gradual change in the form of organization as regards administrative duties has been in progress, the work being grouped in four main branches. All work pertaining to the production of milk has been classed as Dairy Farming Investigations. All that relating to the manufacture of dairy products, such as butter, cheese, etc., is placed under the general heading of Dairy Products Investigations. Everything pertaining to the organization and management of manufacturing and distributing mediums, such as creameries, cheese factories, market milk service, etc., has been put under the general heading of Organization and Management Investigations. The duties imposed by law in the inspection of renovated butter factories form the fourth branch, designated as Renovated Butter Inspection.

DAIRY FARMING INVESTIGATIONS.

SOUTHERN DAIRYING.

A special appropriation of $20,000 made by Congress for the purpose of further developing the dairy industry of the Southern States has been used in educational work among the farmers of that section. Assistance has been rendered in the remodeling of old barns and the building of new ones, the construction of silos, the selection and breeding of herds, the keeping of records of feeds and of the products of the dairy herds, by the investigation of local market conditions and the sources of the supplies that are brought into the South from outside territory, and by attending farmers' institutes and agricultural meetings. Mr. B. H. Rawl has charge of this work. Nine men have been engaged in it in North Carolina, South Carolina, Georgia, Tennessee, Mississippi, Louisiana, and Texas.

This work has met with uniform favor throughout the South. No attempt has been made to reorganize the entire working system of anyone's farm, but the policy has been to call the attention of the farmer to one particular thing in which he might improve conditions

and to get him to do this one thing. This has nearly always resulted in gaining the attention of the farmer, and in nearly every case he has become convinced that it is to his interest to follow the suggestion made. After he has adopted the suggestion as to one important part of his dairy work, other things are pointed out as fast as it is thought he will be likely to undertake additional improved methods. It was early observed that different men must be approached in different ways and that the work must be fitted to the needs of each individual. With some farmers stress has been laid upon keeping records of herds, with others upon the securing of good bulls for the herds, with others upon the securing of markets for their products, and to still others assistance has been given in planning and erecting new buildings or in laying out a crop system that will supply the needs of the herds.

In the course of this work 10 barns and 23 silos were erected during the fiscal year, and 3 barns and 18 silos were in process of construction at the end of the year. The average cost of the completed silos, per ton capacity, was as follows: Modified Wisconsin style, $1.29; stave, $1.36; concrete, $3.63; metal lath and cement, $2.46. Of the last two classes there have been built but one each, both of which are small, hence the cost shown is perhaps too high for average-sized silos.

Many farmers have been induced to keep records of their herds, so as to show the cost of feed and the amount realized from the products both before and while carrying out the suggestions made for improved methods. Such records have been kept for 70 herds, including 1,606 cows. The results from 16 herds, containing 314 cows, have been compiled for illustration and show an average increase of $3.75 in the monthly production of each cow for an average period of five and a half months. This is a striking example of the practical results to be obtained by the adoption of better dairy methods in the South.

So encouraging have been the results of the Department's work that similar work is being taken up by some of the States. The North Carolina department of agriculture has adopted the same system of field work and is planning to place two men in the field for work similar to that being done by the Dairy Division. The Tennessee and Georgia authorities are so favorably impressed with the work that it is only a question of securing the funds when both States will take it up. Louisiana has furnished an assistant to supplement the work of the member of the Dairy Division working in that State. It is believed that after this special educational work has been well started the Department should withdraw and the States should continue it, and the effort has been made to impress the persons conducting the State work with this idea. It is hoped that the

interest created in the various States visited by the representatives of the Dairy Division will encourage others to engage in the work; in fact, this has already been accomplished in many sections. Entire harmony and hearty cooperation exist between the officers of the State experiment stations and the workers of the Dairy Division in every State in which the work is being carried on.

A special effort has been made to encourage the agricultural colleges in these States to extend their work in dairying by giving short courses particularly adapted to the needs of the farm dairyman. Under this encouragement the Mississippi college last winter offered its first short course in dairying. In other States a portion of the time of the Dairy Division men in the field was given in assisting and teaching in the short dairy courses that were offered.

As a result of the work of the Dairy Division the cities of Atlanta, Ga., and Memphis, Tenn., have adopted the score-card system and are rapidly improving their milk supplies.

DAIRY RECORDS AND TESTS.

During the past year an effort has been made to establish a uniform system of keeping advanced registry records among the different breeding associations. This movement was started by the National Association of Dairy Instructors and Investigators at their meeting at Urbana, Ill., in July, 1906, and a committee was appointed to take the matter under advisement and to confer with the various breeding organizations. It was suggested that in addition to securing uniformity in keeping advanced registry records some system of national registration be adopted for certifying animals eligible to such register. The subject has been presented to the different associations at their annual meetings during the year, and the associations have each appointed a member of a committee to confer with the committee from the organization above named and a delegate from the Dairy Division to consider unification of this important line of work and the establishment of a national dairy register of merit.

It is expected, through this branch of the Dairy Division work, to give encouragement also in the formation of test associations for the purpose of keeping records of dairy cows, and also to encourage, wherever possible, the better keeping of general records for dairy farms. It is expected to issue publications from time to time on these subjects. One publication much sought for is Records of Dairy Cows, by Mr. C. B. Lane, assistant chief of the division, and it is intended to supplement this by publishing additional records from year to year.

It is believed that some systematic work should be undertaken by the Dairy Division to encourage farmers to make tests and keep records of their dairy herds. There is no question that if such a plan

were generally adopted the income of the dairy farmers of the country could be largely increased. The average individual farmer can not or will not take up this matter; hence the need for some organized effort in the way of education and demonstration. It is believed that a moderate expenditure for work of this kind would yield large economic results.

DAIRY PRODUCTS INVESTIGATIONS.

This branch, which is in charge of Mr. C. E. Gray, includes work relating to butter, cheese, and milk.

BUTTER.

Fishy flavor.—The investigations to determine the cause of fishy flavor of butter have been continued. While these studies have not reached a stage that will warrant the publication of results, many things have been learned as to the cause of fishy flavor, and it is thought altogether likely that the work in this direction can be brought to a successful conclusion during the coming year. The development of this fishy flavor in butter continues to cause dealers the loss of many thousands of dollars each year, and the cause has been a mystery.

Effect of acidity on keeping quality.—Experiments have also been made concerning the amount of acidity in cream and its effect upon the keeping quality of the butter. In the past it has been the opinion of those most prominent in the teaching of butter making that butter made from cream ripened to a high degree of acidity would be the best for storage purposes. There is no question that the advocates of "high ripening," as it is called, have met with much success in using this method as compared with the method of no ripening, or ripening without any control whatever, so far as the butter maker is concerned. There were, however, those who advocated a milder acidity, claiming that this was conducive to a better keeping quality, and some work has been done in Minnesota and Canada to demonstrate that this kind of ripening gave the best results. To throw further light on the question the Dairy Division undertook extensive experiments in making butter from cream having various degrees of acid development and in storing the butter at different temperatures to test its keeping qualities. Several thousand pounds of butter were made under given conditions and placed in storage.

Chemical analyses and bacteriological examinations were made of the cream before it was churned and of the butter immediately after churning. The cream was divided into two lots, one being pasteurized and the remainder left unpasteurized. These lots were subdivided into smaller lots. One portion was churned without the development of any acidity whatever; another, to which a good starter

was added, was immediately churned; to the third portion the starter was added and the cream was allowed to ripen to a normal degree of acidity, while the fourth portion was the same as the third, except that the cream was allowed to ripen to a very high degree of acidity.

These lots of butter were stored at temperatures of 32° and 10° F. above and 10° F. below zero. The Dairy Division had under its control storage rooms in Chicago admirably adapted to work of this kind, where temperatures were carried at a very uniform level throughout the year. The butter was examined at intervals of a few months. It was found that the pasteurized cream, churned sweet without starter, produced remarkably fine butter that kept without deterioration for weeks after it was taken out of storage. This was at such marked variance with the popular idea of high ripening that it has been deemed best not to publish the results in detail until another year's work can be carried out, in order to have a complete check upon the experiments already made. If the findings of the past year prove to be repeated in the coming year's work, there seems likely to be almost a complete revolution in the methods of making butter from sweet cream. Aside from doing away with the trouble of making the starters and ripening the cream, it will materially shorten the hours of labor of the butter maker and make it possible for the creamery work to be carried on during regular working hours. Under the present system the creamery man has to begin his work at 3 or 4 o'clock in the morning, winter and summer, and rarely ever finishes before 3 or 4 o'clock in the afternoon.

A new moisture test.—One of the greatest needs of the butter maker has been an accurate and rapid method of determining the amount of moisture in butter. During the year Mr. Gray has worked out an extremely simple and rapid method of determining moisture in butter and other products, and a description of this method has been published as Bureau Circular 100. It is understood that already this simple apparatus has been procured and is being used with entire success by many hundreds of butter makers. Under the present-day methods of business the butter maker must know absolutely what he is doing at every stage of his work, and before this rapid means of determining the moisture in butter was made available he was unable under practical conditions to determine whether he was exceeding the maximum amount of moisture allowed by law or was reducing the moisture to an unduly low point and thus materially cutting into the profits of the business. With this simple method, which is known as "Gray's moisture test," there is no longer any reason for such a condition of affairs in any creamery in the country.

Application for United States patent on this apparatus and method has been filed under the act of Congress of March 3, 1883, so that the method may be used by the Government of the United States, or any

of its officers or employees in the prosecution of work for the United States, or by any person in the United States, without the payment of royalty.

Butter laboratories at Albert Lea, Minn.—During the spring of 1907 laboratories for butter investigations were established at Albert Lea, Minn., in cooperation with the Minnesota Experiment Station. Arrangements have been made with the Albert Lea Dairy Association whereby the Dairy Division gets the benefit of its supply of milk—about 25,000 pounds a day—for experimental purposes in the manufacture of butter. Bacteriological and chemical laboratories have been built and equipped on the creamery grounds. This arrangement is expected to be of great assistance in furthering the butter investigations of the division.

CHEESE.

The cheese investigations consist of three general lines—soft cheese investigations at Storrs, Conn.; Cheddar cheese investigations at Madison, Wis., and Swiss cheese investigations at Albert Lea, Minn.

Soft cheese investigations.—In these investigations, conducted in cooperation with the Storrs Experiment Station, progress has been made during the year in working out the methods of manufacture of Camembert cheese, and a bulletin (No. 98) giving directions for making this type of cheese has been published. The work on Camembert has been practically completed, and at the present time the main effort is being directed toward the problems involved in the manufacture of Roquefort cheese. Much remains to be done in connection with the latter, particularly in securing the right texture in the product.

Cheddar cheese investigations.—This work is being carried on in cooperation with the Wisconsin Experiment Station. The main problem under consideration is the use of acids of various kinds in the manufacture, rather than the developing of lactic acid in the milk. There are some features in connection with this substitution of acid which, if they prove successful, will bring about a great saving to the manufacturers of the Cheddar type of cheese, both in time and in the losses sustained under the ordinary methods of manufacture.

Swiss cheese investigations.—Investigations concerning the Swiss type of cheese have been begun at Albert Lea, Minn. In connection with the laboratory plant used for butter investigations, there has been constructed a curing room for this kind of cheese. Space has been secured in the creamery plant for the manufacture of the cheese, and milk is purchased from the Albert Lea Dairy Association for this purpose.

The fundamental problems involved in the manufacture of Swiss cheese are but little understood; the whole process seems to be one of "rule of thumb" rather than any scientific method. Makers of the Swiss type of cheese in this country, as well as in Europe, follow the plan which has been in vogue for a great many years in Switzerland and Germany in the manufacture of cheese. This method is open to many objections, as it is almost impossible to get a uniform product with any degree of certainty, and the losses sustained in the making through the loss of butterfat in the whey are very heavy. The physical and biochemic processes of ripening have not been studied to any considerable extent in this country or abroad. This is a large and important field of investigation, as the manufacture of the Swiss type of cheese is next in importance to that of the Cheddar type in this country.

MILK SECRETION.

One of the most interesting problems in dairying and one that is fundamental to all else is the secretion of milk and the various changes that milk is subject to because of different conditions of breed, feed, lactation period, climate, health of the cow, etc., and there is very little literature that throws light on the questions involved.

At the beginning of the year arrangements were made with the Missouri Experiment Station to take up a thorough and prolonged study of this subject. From the nature of the problems and of the investigations proposed it is expected that a long period of time will be required to complete the work.

It seemed desirable to give special consideration to the changes that come about by the advances in the period of lactation, consequently it was decided to select a number of cows of the different breeds and make a careful and systematic study of the milk of each cow from the beginning to the end of her milking period. Sixteen cows have been selected for this preliminary test. It will be necessary to repeat the test another year in order to guard against irregularity and to give a complete check on the work, as there are no complete previous experiments available for comparison.

Among other things studied will be the color of the milk. While the cows are being fed on identically the same feed during the entire period of lactation, there are some differences in color of the milk, probably due to breed and milking period, and these will be studied throughout the period. As soon as certain fixed characteristics, such as breed of the animal and advance in lactation period, have been determined it is expected to take up different feeding stuffs and determine the effect of each on the chemical and physical constituents of the milk.

OTHER MILK INVESTIGATIONS.

Plans have been made for taking up during the coming year an extended study of pasteurization and other processes which may affect milk from a bacteriological and chemical standpoint, with special reference to the preparation of milk for market purposes. This is an important subject which has hitherto received but little attention from the Dairy Division.

ORGANIZATION AND MANAGEMENT OF DAIRY ENTERPRISES.

Investigations on this subject are divided into two general sections, one, relating to market milk, under the supervision of Mr. C. B. Lane, assistant chief of the Dairy Division, and the other, dealing with creameries, cheese factories, etc., under the supervision of Mr. B. D. White. The work is almost entirely educational, the object being to put into actual practice the experience and facts obtained from the research investigations. The method of procedure is to carry on an educational campaign by correspondence, securing reports from all kinds of dairy concerns, attending dairy meetings of various kinds, and giving such assistance as may be possible in the general development of the dairy interests of the country.

MARKET MILK SERVICE.

Milk supply of Washington, D. C.—One of the main features of the work during the year has been the investigation of the milk supply of Washington, D. C. Nine hundred and eighteen dairies, with 16,446 cows, were inspected and rated according to a score card prepared by the Dairy Division, 100 points representing a perfect score. Of these dairies 526 were located in Maryland, 294 in Virginia, and 66 in the District of Columbia. With a few exceptions the conditions found were not at all satisfactory, the average of all the scores being only 45.03. The scores covered such items as condition of cows, tuberculin test, sanitation and arrangement of stables and milk houses, health and cleanliness of milkers, and handling and cooling of milk. There were found to be 74 establishments where milk was handled in the city, and the average rating of these was 72.58. One hundred and forty-four bacteriological examinations were made of milk taken at random from wagons on the streets of the city during hours of delivery.

Milk supply of other cities.—Aside from the work which has been done in and around the city of Washington, there have been many calls from outside cities, mainly from boards of health, for assistance in improving their milk supplies. Assistance was rendered to the following cities during the fiscal year: Hollister, Los Angeles, Oak-

land, Pasadena, Redlands, Riverside, San Bernardino, San Diego, San Francisco, San Jose, Santa Barbara, Santa Cruz, Stockton, and Vallejo, Cal.; Boulder, Colo.; Hartford, Conn.; Atlanta, Ga.; Boston and Brockton, Mass.; Montclair, N. J.; Cortland, Glens Falls, and Syracuse, N. Y.; Cleveland, Ohio; Memphis, Tenn., and Richmond, Va. The usual method of procedure in such cases has been to have the board of health call a general meeting of the dairymen and consumers, together with the physicians of the city, for a complete and comprehensive discussion of the milk situation in the city. Special meetings are called for the physicians, and often for the city council, for the purpose of taking up in detail special features that these bodies would be interested in from legislative and administrative standpoints. The use of the score card is discussed, and the inspector who goes from the Dairy Division gives such information as may be needed. It is required that these cities make reports from time to time of the progress made. Calls for assistance of this character are coming faster than they can be filled with the number of men available for this work. With an adequate force this feature of the work of the Dairy Division could be greatly extended with undoubted benefit to the public.

Milk and cream contests.—In February, 1906, there was held at Chicago, under the auspices of the Dairy Division, as a part of the National Dairy Show, a competitive exhibition of milk and cream, with the object of promoting better conditions for handling milk and cream for home consumption. This was the beginning of a work that has been extended during the fiscal year 1907, similar contests having been held in New Hampshire, Massachusetts, Connecticut, Pennsylvania, Illinois, and Missouri. These events have been productive of much good in the improvement of the milk supply. Perhaps the most successful of these contests was the one held at Cleveland, Ohio, in March, 1907. The subject was taken up jointly by the chamber of commerce and the city health department. A large number of samples of milk and cream were exhibited and scored, dairy farms were inspected and scored, prizes were awarded, meetings were held, and addresses made. The interest of dairy farmers and milk producers, as well as physicians and sanitarians, was enlisted, and the result was a general awakening for better milk in the city, to the benefit of both producer and consumer. A report of this meeting has been prepared for publication.

Modern dairy at Jamestown Exposition.—The Dairy Division installed and is conducting at the Jamestown Exposition what is termed a modern dairy plant. It is located in the food building and consists of two parts, one of which shows the necessary equipment and methods for a small dairy farm bottling milk for market purposes, and the other the methods and necessary machinery for handling a

large city and milk business, with pasteurizing apparatus, bottling machine, etc. Literature relating to market milk is kept on hand for distribution, and stereopticon lectures are given on different phases of the market milk service.

CREAMERY INVESTIGATIONS.

A thorough study is being made by the Dairy Division of different plans of organization of dairy enterprises, with special reference to cooperative work, and assistance is given wherever practicable in the organization of cooperative and other dairy concerns.

The division has solicited reports from the various creameries of the country with a view to giving them assistance in their business methods, methods of manufacture, and keeping of records. At the close of the year about 500 or 600 creameries were reporting monthly to the division, each giving a statement of the amount of milk and cream received from the creamery patrons, the amount of butter sold, the overrun obtained, the expense of operating the business, etc. A careful analysis of these reports shows that there is a heavy loss to many creameries and to the farmers supplying them because of lax methods of manufacture and the absence of system in keeping records.

The creameries settle with the farmers supplying the cream on the basis of the butterfat contained in the cream. The quantity of butter produced naturally exceeds the amount of butterfat in the cream, the excess being caused by water, casein, salt, etc., which are incorporated with the butter. This excess is termed "overrun," and normally amounts to 18½ per cent. If a creamery does not show an overrun to this extent it may be assumed that there is some waste in manufacture or some laxity in keeping records, the result in either case being a loss to the business.

Reports for the year 1906 and the first months of 1907 from several hundred creameries in Minnesota, Iowa, and Wisconsin show that in 63 per cent of the creameries the overrun fell below 18½ per cent. In Wisconsin the percentage of reporting creameries coming below this mark was 68, and the average overrun was but 15.7 per cent. In Minnesota 63 per cent of the creameries reporting failed to reach the normal overrun, the average being 16.66 per cent. For Iowa the percentages were 57 and 16.46, respectively. Applying these percentages to all the creameries in the States named, the total loss sustained by reason of the low overrun is calculated as exceeding $2,000,000 annually, and the loss for the entire country is estimated at more than $5,000,000 a year. The reports also show that, as might naturally be expected, the creameries making an overrun of 18½ per cent or more yield better returns to the persons supplying the cream than are paid by the creameries with low overruns.

As the monthly reports are received, letters are immediately written by the Dairy Division to the creameries whose reports show low overruns or indicate defective work of any other kind. In these letters the defects are pointed out and suggestions are made for remedying them. This has already resulted in a material betterment of the conditions in many creameries.

The Dairy Division maintains offices in New York and Chicago, with a butter expert at each place whose special duty it is to inspect the butter received at those markets and give helpful suggestions to butter makers and creamery managers. Large quantities of butter deficient in quality are found on these markets. The trouble may be due to poor cream or milk or to poor workmanship, and because of such defects the butter may not bring good prices. Butter may leave the creamery in apparently good condition and yet be unsatisfactory after it arrives at its destination a week or two later. When requested by the shipper the experts of the Dairy Division examine a shipment on its arrival at market and send to him promptly a reliable report as to its condition and quality. If the butter is not satisfactory they state what the defects are and make suggestions for overcoming the trouble. These reports are not in the nature of fault-finding criticism, but are intended to help the butter maker to produce a better product and obtain a better price. Facilities are provided for a limited number of chemical analyses of butter found on these markets. The plan is for the inspectors to spend three weeks of each month in the city and the remainder of the month in visiting creameries that seem to be having most trouble with their product. In Chicago up to July 1, 1907, the butter from 525 different creameries was inspected and 1,394 letters were written to butter makers and creamery managers telling them of the faults in their butter and making suggestions for improvement. The New York inspector likewise examined the product of several hundred creameries.

As this work has progressed, more and more of the creameries have taken an interest in it and have availed themselves of this service, and the commission men have also found that it is to their advantage to have a disinterested expert examine the butter and send a report to the creamery. Many commission men have stated that the services of the inspectors have resulted in much good in a general improvement of the quality of the butter received on the market.

A system of score cards for indicating the sanitary condition of creameries and the ability of the creamery men to conform to the standard regulations has been worked out by the Dairy Division and adopted by a number of the State dairy and food commissions. The division furnishes blank forms for these reports to the inspectors in the States where the system has been adopted. These forms are made out in quadruplicate, one copy being given to the creamery, one sent

to the State dairy and food commissioner, one to the Dairy Division, and one retained by the inspector. Reports show that the system is working very satisfactorily and that it results in much improvement in conditions.

THE CREAMERY SITUATION.

A special investigation has been made of economic and commercial conditions in the creamery business and information has been secured showing that there is practically a monopoly of this industry in some sections, while in others the business is largely conducted on a cooperative basis or there is fair competition, the result being that under the latter conditions the farmers are receiving from 6 to 8 cents a pound more for their butterfat than in territory controlled by the monopoly. This difference is due partly to the methods of the so-called "centralizers" and partly to the inferior quality of the butter produced by those concerns because the cream is collected over a wide territory and much of it is received in a stale condition.

That a very large percentage of the butter found in the market is below grade, selling for less than market prices for fine butter, and that the farmers in a very large area of butter-producing territory receive much less than a fair price for their product are both matters of record. That the losses from these sources amount to millions of dollars annually to the farmers of the country is easily demonstrated.

For convenience in designation, the creameries are divided into four classes. Cooperative creameries are owned and operated by the patrons—that is, the persons who supply the cream—and the entire receipts, less actual running expenses and sinking fund, are divided among the farmers in proportion to the amount of butterfat delivered by each. Individual creameries are those owned and operated by private interest and doing local business. When three or more individual creameries are owned or controlled by the same interests, they are designated as combination creameries. The fourth class—"centralizers"—is composed of creameries that receive cream from greater distances than it can be hauled in by wagons, the distances extending up to 400 or 500 miles. The plants are usually large, and an extensive system of agencies for the purchase of cream is maintained.

The investigations show that the cooperative creamery yields the largest returns to the farmer for his butterfat. The individual and combination creameries, usually being located in close competition with the cooperative creameries, pay very nearly as much. The centralizers, where they have gained a monopoly, pay as little as the farmer will accept. Reports for July, 1907, show that in Kansas and Nebraska, where the monopoly appears to be complete, the farmers received only 17 to 18 cents a pound for their butterfat, while in

northern Iowa, Minnesota, Wisconsin, and Illinois, where the cooperative creameries have the field, the prices were from 25 to 26 cents.

The methods of the centralizers are sometimes very reprehensible. Where these concerns have come into competition with small creameries, they have raised their prices to a point that made it impossible for the small concerns to continue, and have thus forced the latter out of business. Competition having been destroyed and a monopoly secured the prices paid to the farmers were lowered. The large concerns operating over a great territory, with here and there a competitor that they wished to put out of business, could in one locality raise the price paid above that possible to pay with profit and at other places decrease the price so little as not to be apparent and more than offset the loss. This ability to destroy competition without inflicting self-injury has been used effectively in many localities.

Perhaps the most potent factor, however, in restricting the business of the small creamery has been the special low rates reported to be granted by the railroads to the big creameries. These rates were understood to be much lower than for any similar commodity, being only about one-third of the rate on butter. In Nebraska, in the best territory, the gross earnings for hauling cream were but 13 cents per car mile, while the settling basis between railroads for hauling empty cars was 15 cents per car mile.

The system of killing the small creameries has been carried on to the fullest extent in southern Iowa, Missouri, Kansas, and Nebraska. Taking Kansas as an illustration, it is found that the number of creameries declined from 133 in 1900 to 67 in 1905, while in Minnesota in the same period there was an increase from 582 to 905. The decrease in Kansas is attributed to dissatisfaction and distrust on the part of the farmer with the central creamery, to the low prices paid, the poor quality of the butter, the killing of the small creameries, and the loss of all immediate contact between the farmer and the owner of the business. The increase in Minnesota can be accounted for by just the reverse set of conditions. The loss to Kansas farmers during the last year on account of the low prices alone is estimated at $1,000,000. If Kansas had made 50,000,000 pounds of butter, as it should, instead of 17,000,000, the income to the State would have been, on the same basis of valuation, at least $12,000,000 greater than it is for the present year, and there would have been no less wheat, corn, alfalfa, beef, pork, or any other crop raised. The reason why Kansas is not on a par with Minnesota, Iowa, and other great dairy States is because the industry has been promoted from the centralizer standpoint and not for the interests of the farmer. Fifteen years ago Kansas and Minnesota stood nearly equal with regard to the creamery industry. Now Minnesota is not only far ahead in volume of production, but the Minnesota farmer gets 6 to 7

cents a pound more for butterfat than does the Kansas farmer. What has been said of Kansas applies in general also to Missouri, southern Iowa, and Nebraska.

Investigation has shown that the highest grade of butter is made only from whole milk delivered to the creamery fresh every day. This is possible only where there are local creameries at convenient distances. The longer the time between milking and churning the poorer the quality of the butter. Shipping cream by railroad except for very short distances is detrimental to the quality of the butter.

The centralizers, on account of receiving cream from long distances, are unable to turn out as high-grade product as the local concerns that use fresher cream, but they are usually managed so as to get every possible cent of revenue from their material. They use the most improved methods of manufacture, get a maximum overrun, and prevent loss in every possible way. The small creameries, on the other hand, are often very lax in these matters, but by reason of the superior quality of their product and their practice of giving full returns to the farmers they are still able to pay 6 or 7 cents a pound more for butterfat. By no means do all of the small creameries make fancy butter, however. Some of them have doubtless succumbed largely because of losses which might have been prevented by better methods.

There can be no doubt that the tendency of the centralizing system is bad for both the farmer and the public. The effect is to exact high prices from the consumer and to pay low prices to the farmer, the profits going to the large operators who control the situation. The small local cooperative creameries should be encouraged. The Dairy Division is already endeavoring to assist the creameries to avoid losses by low overrun, loose methods, etc., and to improve the quality of their product where this is defective, by its service of inspecting and reporting on the butter as it arrives on the market, as hereinbefore described. In order that the farmers may receive proper returns for their product there should be a material improvement in the quality of the butter as found upon the market. This can best be accomplished by encouraging local creameries, better methods of manufacture, and, greatest of all, a discrimination as to quality in the markets. Butter is not bought on the basis of quality, as it should be, but the tendency is more and more in that direction. The chief handicap is a lack of inspectors. The work of the division already shows that national supervision of interstate trade in butter would operate greatly to the benefit of the creameries. The cost of Federal inspection would not be as great as might be at first supposed. A careful estimate based on experience already gained shows that 25

men could handle this work without difficulty. Part of these men could be detailed to work in the field with the creameries to give personal instruction to those most needing it. Such instruction will be needed, especially in the centralized territory where small creameries will be established if conditions make it possible. It is the belief of many interested in this work that the increased returns to creameries through such supervision and inspection would result in millions of dollars saved to the farmer each year.

Publicity as to the prices received by farmers in various sections for their butterfat would be a powerful agency in enabling the farmers to obtain better returns from the "centralizers." The Department could gather this information and disseminate it. New York, Chicago, and Elgin quotations on butter are not printed in the papers published in the territory most affected by the centralizers. Only local quotations are published, and these are several cents below the actual market prices. The farmers in that territory have no way of finding out what the farmers of other sections are getting.

DAIRY BUILDINGS.

The work of planning buildings of various kinds for dairy purposes has been continued throughout the year. The Dairy Division has many demands for information of this kind, and a constant study is being made of the various forms of buildings for housing cattle, for cheese factories, creameries, and market milk plants. This field is not covered by commercial architects for the reason that as a rule such work does not pay a sufficient revenue. The main object is to produce plans for buildings that are best adapted for the object in view at a minimum cost and that will contain all the features of sanitation that should be included in buildings of this character. During the year 56 plans have been drawn and 504 blueprints made and sent out in answer to requests. In sending these plans to dairymen it is expected that each person will make a report to the Dairy Division of the cost of erection. It is desirable to secure as many accurate statements of cost as possible, in order that approximately correct information may be given to prospective bidders. A limited number of these buildings are erected under the supervision of the division. This is done where it is thought desirable to have careful records kept and in locations where there are no previous examples to guide the builder. This has been particularly true of the southern dairy work, as outlined elsewhere in this report.

CHEESE STATISTICS.

The Dairy Division for a year and a half has collected monthly statistics of stocks of cheese on hand. Each month there is mailed to the proprietors of all the storage warehouses and to cheese dealers

who store cheese a special form, upon which they are requested to make a report of the stocks on hand on the first day of the month. From these reports a statement is compiled and issued from the office of the Dairy Division about the 5th or 6th of each month. This work seems to meet a demand among the manufacturers and dealers in cheese. A circular letter was issued the 1st of January, 1907, asking those who had contributed to these reports and those who had received them monthly whether in their judgment the work was of enough value to be continued another year. Almost without exception the replies indicated that the work should be continued, many stating that it was very valuable to them in their business.

RENOVATED BUTTER INSPECTION.

The inspection of renovated butter and of the factories producing the same, under the act of Congress of May 9, 1902, has been continued, under the general supervision of Maj. M. W. Lang, with offices in Chicago and New York City.

For the year ending June 30, 1907, there were 49 renovated-butter factories bonded and which paid the Government tax. A few of them were in operation only a part of the year. During the year a combination of 8 factories was consummated, 3 of which have since been permanently closed. One new factory was built and 4 were rebuilt with increased capacity. These 49 factories produced during the fiscal year 62,919,998 pounds of renovated butter, an increase of 9,124,337 pounds over the previous fiscal year. Renovated butter was inspected for export as follows: At Chicago, 3,332,456 pounds; at New York, 1,837,924 pounds, and at Boston, 368,090 pounds, a total of 5,538,470 pounds.

The general condition of the factories during the year was fair from a sanitary standpoint, and the quality of the product was really superior to what it has been in past years. This is probably due to the fact that the packing stock used has been fresher.

Near the close of the fiscal year a committee was appointed by the Secretary of the Treasury and the Secretary of Agriculture to revise the regulations for the inspection of renovated butter. The report of this committee has been submitted to the Secretaries of the two Departments and the new regulations adopted to take effect August 15, 1907. The only essential change made in the regulations was the granting of the privilege to the manufacturers of using the word "process" in place of "renovated," as allowed by law, if the manufacturer preferred the former term.

PUBLICATIONS.

The Bureau's publications are an important feature of its work. Several of those issued or prepared during the fiscal year have already been mentioned. In addition, the Twenty-second Annual Report of the Bureau (for 1905) has been issued, and the Twenty-third Annual Report (for 1906) has been prepared for publication. These annual reports are volumes of several hundred pages, containing special articles and miscellaneous information relating to the live-stock industry and the work of the Bureau. Congress at its last session ordered a new edition of the Special Report on Diseases of the Horse. A chapter on "Osteoporosis, or bighead," was added, and some slight revision made, and soon after the close of the fiscal year the new edition appeared. This book has proved to be one of the most popular publications ever issued by the Government, the total editions approximating 900,000 copies.

The new publications of the Bureau during the twelve months ending June 30, 1907, were 78 in number, consisting of the Twenty-second Annual Report of the Bureau, the annual report of the Chief, 21 bulletins, 16 circulars, 2 Farmers' Bulletins, 30 orders and regulations, 3 Yearbook articles, and 4 miscellaneous publications, aggregating 2,110 printed pages. In addition there were numerous reprints of earlier publications.

THE PRESERVATION OF OUR NATIVE TYPES OF HORSES.

By GEORGE M. ROMMEL,

Animal Husbandman, Bureau of Animal Industry.

INTRODUCTION.

The development of types of light horses has been notable in America. In colonial days the Narragansett pacer was a famous type, and later came the Morgan, the Standardbred, and the Saddle Horse. The specialization of these light types is a national trait, and in spite of importations from abroad we have still clung to the native types and have developed them. In respect to the draft horse, on the other hand, we have with only one exception—the Conestoga draft horse—relied entirely on the transplanting of foreign breeds for our supply. Since the Conestoga horse has vanished completely, leaving no discernible traces on the native stock, we have no native material from which to build up breeds of draft horses.

In the matter of light horses, however, we are especially fortunate in having types which have been developed from stock brought to the country during a period covering some three hundred years, little of which was cold-blooded. This stock and the descendants from it have left a progeny which contains probably a smaller amount of cold blood than that of any European country. From it have descended the types and breeds mentioned above, and in it the country has unequaled possibilities for further development.

The last century was as momentous in the development of horse breeding in the United States as in material, financial, and political development. Messenger, imported in 1788, and Justin Morgan, foaled in 1789, were just beginning to make an impression on the horse stock when the eighteenth century closed. Lady Suffolk, 2.29½, trotted the first mile under 2.30 at the Beacon Course in Hoboken on October 13, 1845; Alix made her record of 2.03¼ at Galesburg on September 19, 1894, and Lou Dillon finally got within the two-minute mark at Memphis nine years later—only three years after the nineteenth century closed.

Denmark, the foundation sire of the breed of American Saddle Horses, was foaled in 1839, and Hambletonian 10, the foundation sire of Standardbreds, just ten years later. The Morgans, therefore, had some fifty years start over the Hambletonians and Denmarks, and it is

not surprising that fifty years ago they shared with the Thoroughbred the first place in popular esteem.

With the development of speed in the light harness race horse the superior qualities of the descendants of Hambletonian 10 and his sons became recognized, and for a time the tendency to concentrate this blood threatened to swamp every other strain, especially the Morgan and Clay blood, both of which possessed beauty of conformation, action, and quality, but with few exceptions failed to show the inherent speed possibilities shown by the Hambletonians. The Clay blood can not be found now in its purity, and until recently the indications were strong that the Morgan was similarly fated.

That the Hambletonian line was especially strong in its speed-producing powers is an admitted fact. That it has been the most powerful factor in the development of the light-harness trotter as a race horse is a truism. But Rysdyk's Hambletonian himself was not an object of great beauty, except in action. He had a wonderfully true and frictionless straight-line trot, with an ability to extend himself when in his stride that is most important in a race trotter. He transmitted the trotting instinct to his descendants in a marked degree, but he also gave many of them the manifest faults of conformation which he himself had. These faults are generally admitted by trotting-horse men and are points which the best breeders of to-day are endeavoring to eliminate. From the market standpoint they are grave faults, and unless the animal has a large amount of speed they seriously depreciate his value.

The development of the trade in fine market classes of light horses in the United States and the presence of these faults in the native horse led largely to the importation of Hackney, French, and German coach horses. A few Cleveland Bays and Yorkshire Coachers were brought over also. From 1870 to 1890 these horses, especially the Hackneys, were given every opportunity to show their mettle in the stud as well as in the market and show ring. Yet the American horse, selected by shrewd buyers, was able to compete successfully with them, first masquerading under the name of the foreign breed, but finally standing on his merits as the American horse.

These horses came from all over the country, wherever trotters were bred; but the New England States, Kentucky, and the corn-belt States were the main sources of supply. In many cases they were properly called accidents—that is, they were not bred for the market or show ring as carriage horses, but for the race track. Failing in the latter qualification and possessing good conformation, style, action, and quality, they were not appreciated by the man who was breeding solely for speed, and were readily sold to be developed

for the market. Stallions were bought and usually castrated; young mares were taken from the breeding fields and never bred. For example, the horse Lord Brilliant after being bred to a few mares in Illinois was sold and castrated, and afterwards made a remarkable record as a show horse. Entire, he would have been of the greatest value to the horse industry; castrated, he was worth only his market value as a show horse. A story, told on good authority, regarding the sire and dam of this horse further illustrates the point. It is said that the sire had a similar fate to Lord Brilliant and was sold and castrated, while the dam was bought by a dealer and exported. Thus the family was almost annihilated. A few descendants survive, and it is greatly to be hoped that they will be given an opportunity at the stud.

These facts indicate that the great danger which threatened the development of the carriage-producing lines in the Standardbred was the buying up of mares from the breeding farms and the castration of stallions. Farmers and breeders did not sufficiently appreciate the value of the horse for anything but speed production. In the case of the Morgan the same thing was true in another way. Everyone knew the qualities of conformation, style, and endurance which the breed had, but few realized that in the long run those qualities were worth more money than speed records. With the track records of Ethan Allen and Daniel Lambert before them, Morgan breeders began to think that the Morgan could be made a race horse, and the speed craze struck them also. When the especial value of the Hambletonian and George Wilkes lines for speed production began to be recognized Morgan breeders resorted to crosses with them, and the Morgan soon became affected by the change in breeding methods. Whereas the usual conformation had been rounded and compact, it became more angular and rangy. The desire for greater size in the Morgan found its expression in similar and even more violent crosses. As a result we have the Morgan situation of to-day—a few real Morgans fostered by breeders who were loyal to breed standards and who were not carried away by the fashion of the hour, and a very great many which trace to Justin Morgan and are registered as Morgans but are Morgans only in name. Anyone witnessing the Morgan exhibit at the horse show of the Louisiana Purchase Exposition at St. Louis in 1904 could not fail to be impressed with this fact. The real Morgan was there, but he was to a large extent obscured by the great number of ungainly, ill-assorted horses which were in type more Standardbred than anything else, but which, if entered in the Standardbred classes, would have received little attention from the judges.

THE INTRINSIC VALUE OF AMERICAN BLOOD.

That it would be a misfortune to allow our native types to be lost is shown (1) by the influence of the Morgan on the development of the American Saddle Horse, (2) by the influence of various strains in the stock registered in the American Saddle Horse Register on the development of horses suitable for carriage and general purposes, and (3) by the value of certain blood lines in the Morgans and Standardbreds to produce the same useful types.

INFLUENCE OF MORGAN BLOOD ON THE SADDLE HORSE.

Among the most prominent sires whose influence on Kentucky saddle stock has been of permanent value, Cabell's Lexington, Cole-

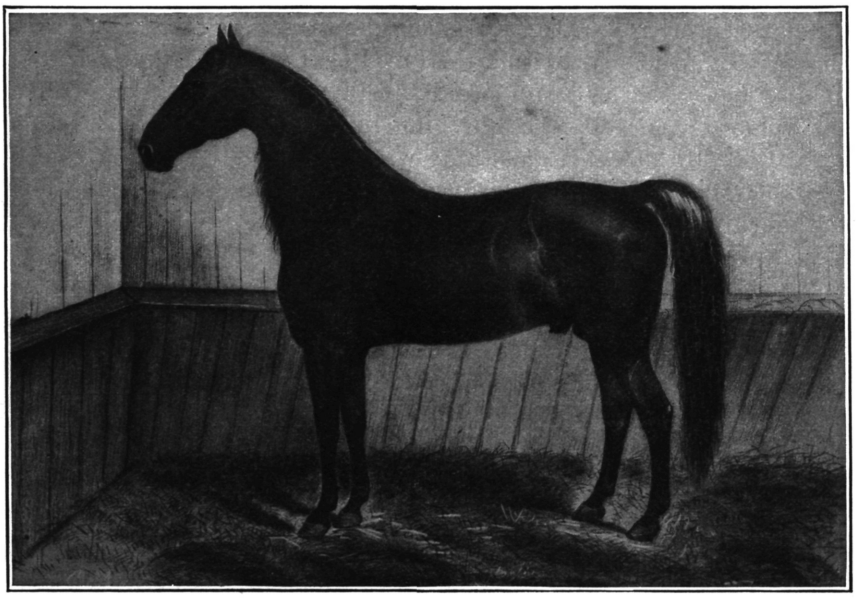


FIG. 1.—Harrison Chief. By Clark Chief; dam Lute Boyd by Joe Downing. The sire of Wilson's King and Bourbon Chief. (Photograph from a painting, by courtesy of Kentucky Farmer and Breeder.)

man's Eureka, Peavine, Indian Chief, and Harrison Chief stand out distinctly. Of these horses all but Harrison Chief trace in direct male line to Justin Morgan and are registered in the American Morgan Register.

Cabell's Lexington was by Gist's Black Hawk, he by Blood's Black Hawk, he by Vermont Black Hawk, and he by Sherman Morgan, a son of Justin Morgan. Through the female line, Cabell's Lexington traces through the sire of his dam to Sherman Black Hawk, one of the best of Vermont Black Hawk's sons.

Coleman's Eureka was by Young's Morgan, he by Butler's Eureka, he by Green Mountain Morgan, he by Gifford Morgan, and he by

Woodbury Morgan, a son of Justin Morgan. The dam of Butler's Eureka was also by Gifford Morgan.

Peavine was by Rattler, he by Stockbridge Chief, and he by Vermont Black Hawk.

The pedigree of Indian Chief is somewhat in dispute in certain lines, but the fact is well established that he was by Blood's Black Hawk, a son of Vermont Black Hawk.

Butler's Eureka, the grandsire of Coleman's Eureka, and Blood's Black Hawk, the grandsire of Cabell's Lexington and the sire of Indian Chief, were both bred in Vermont and taken to Kentucky in the decade before the civil war. The blood of these and other horses

FIG. 2.—Eckersall and Tattersall. Horses which show what "saddle" blood can do in the production of high-class carriage horses. (Photograph by courtesy of Kentucky Farmer and Breeder.)

can be found all through Kentucky, and Maj. David Castleman is authority for the statement that of the horses registered in the first two volumes of the American Saddle Horse Register over 10 per cent trace in direct male line to Justin Morgan.

"SADDLE" BLOOD IN AMERICAN CARRIAGE HORSES.

It is well known that many of the best and highest-priced harness horses which go out of Kentucky are practically saddle-bred and some of them are registered in the American Saddle Horse Register. The breeding of these horses is exceedingly interesting and instruc-

tive. For example, a pair known as Tattersall and Eckersall (see fig. 2) was sold about two years ago for $6,000. Tattersall is registered as No. 2007 in the American Saddle Horse Register. He was bred by J. Gano Johnson, Mount Sterling, Ky., and was sired by Bourbon Chief, dam by Red Cloud, a son of Indian Chief; second dam by Rhoderick, by Mambrino Le Grand; third dam by Magic, a Standardbred horse by American Clay, he by Cassius M. Clay, jr. As is well known, Bourbon Chief was by Harrison Chief, a grandson of Mambrino Chief; his dam was by Latham's Denmark by Wash-

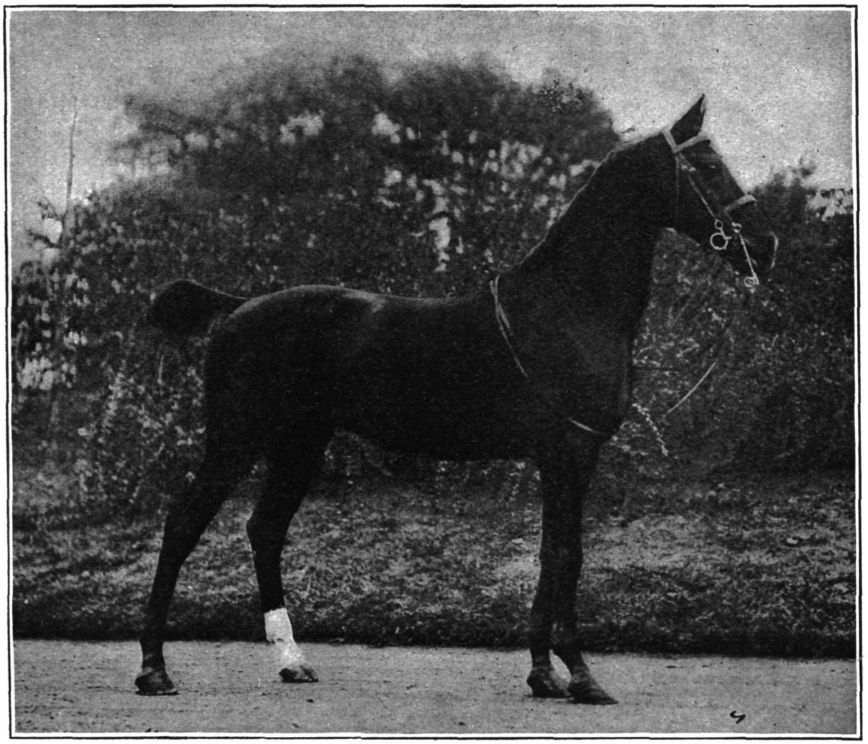


FIG. 3.—Orinda. By Logic; dam by Magic. Winner at the Blue Grass Fair in 1907 in the class for brood mares of carriage type, 4 years old and over. (Photograph by courtesy of Clifton Farm.)

ington Denmark, a grandson of the original Denmark. Crosses of Standardbred, Thoroughbred, Denmark, Clay, and Morgan therefore appear in Tattersall's pedigree.

Tattersall's mate, Eckersall, was bred by John T. Woodford, Mount Sterling, Ky. He is a full brother to Mira 2965(S.), and is therefore by Forest Denmark, dam Kitty Fogg, by Beauty, a son of Magic; second dam Puss by Rob Roy, a son of the original Denmark. In this pedigree the Denmark blood is most prominent, but Standardbred and Thoroughbred blood appear somewhat far back. Ecker-

sall's breeding is unusual on account of the large amount of Denmark in it. Denmark blood is almost exclusively saddle blood.

Another case is Emma Briggs, registered as No. 2895. She was bred by Charles McCormack, Waddy, Ky.; was foaled in 1899, and was shown under the name of " Poetry " at the Chicago Horse Show in 1902, alone and as a mate to Dainty Miss, winning with mate in class and being single reserve champion for heavy harness horses under 15.2 hands. Emma Briggs was by Chester Dare, tracing in direct male line to Denmark, and to Thoroughbred through Chester Dare's female line. Her dam was by Highlander, by Joe Young, by

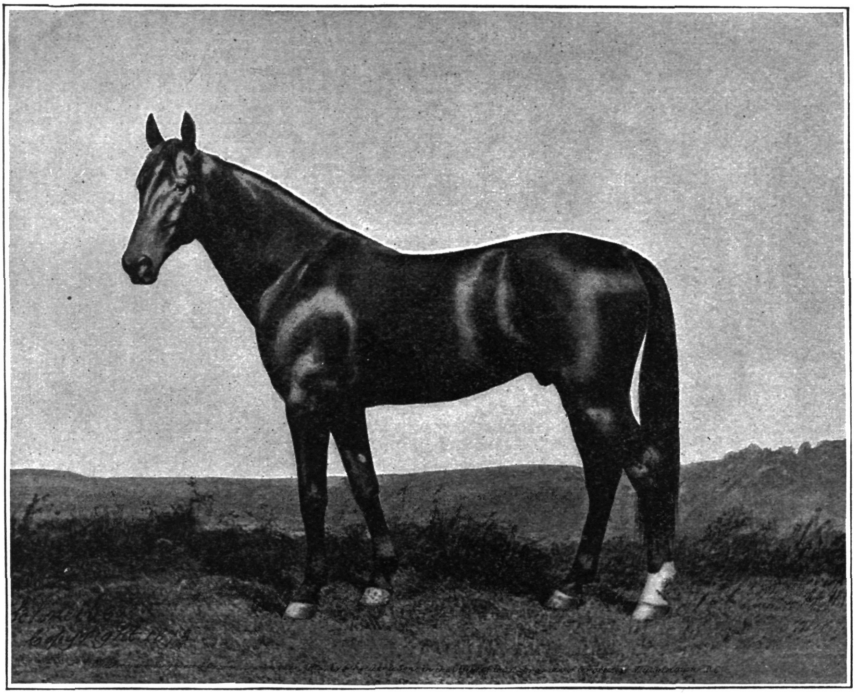


FIG. 4.—Belmont 64. Son of Alexander's Abdallah, and a horse often found in the pedigrees of American carriage horses. Belmont was the sire of Egmont, who sired Johnnie Mack, the sire of Lord Brilliant.

Star of the West, a grandson of Vermont Black Hawk. Joe Young's dam traces principally to Clay and Thoroughbred, with the Charles Kent mare, by Bellfounder, the dam of Hambletonian 10, well back in the pedigree. Emma Briggs's pedigree therefore shows Denmark, Thoroughbred, Standardbred, and Morgan, with a slight amount of Clay and old Hackney blood far back.

From the standpoint of fame in the show ring, however, first place among the carriage horses which have gone out of Kentucky must be given to Glorious Red Cloud. This horse for a period of years was, perhaps, the most sensational animal in heavy harness at the National

Horse Show, and in the opinion of some judges was the best horse that has ever worn heavy leather in America. After a brilliant show-ring career he was retired, and has since been in the stud in Massachusetts, also in Iowa, and for the past two years in Kentucky. He is registered No. 2845, is a bay, standing 15.3½ hands, weighing 1,225 pounds. His sire was Wilson's King and his dam Kit Cloud, by Wyatt's Red Cloud. Red Cloud was by Indian Chief out of a mare (the dam of Wilson's King) by Parson's Abdallah, a son of Alexander's Abdallah. The inbreeding resulting from the mating of a daughter of Wyatt's Red Cloud to King doubtless had much to do with the making of Glorious Red Cloud what he was as a carriage

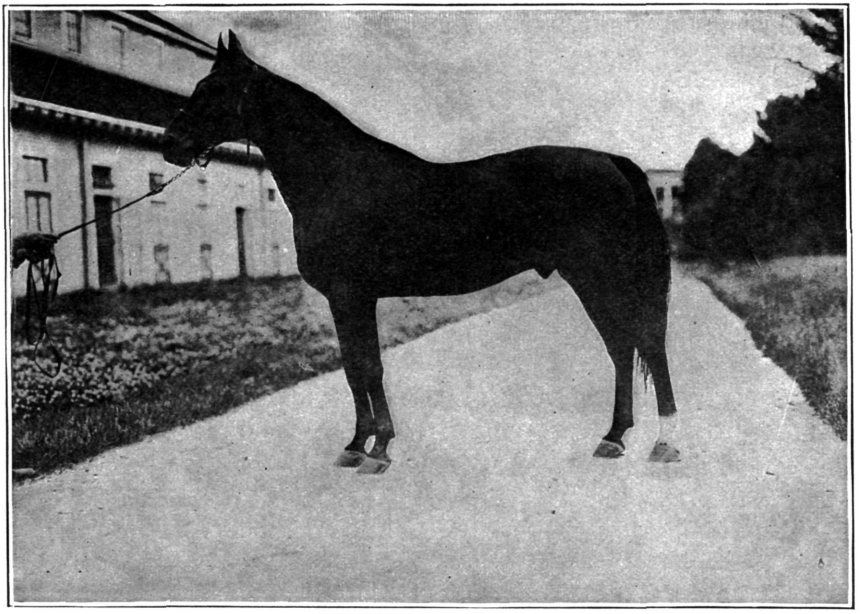


FIG. 5.—Walnut Hall. By Conductor 12256; dam Maggie Yeazer by Red Wilkes 1749. An excellent illustration of the best type of trotter. A horse not only notable as a speed sire, but one which transmits his excellent conformation and quality as well. (Photograph by courtesy of Walnut Hall Stock Farm.)

horse, because in addition to the proved value of King as a sire of carriage horses, Alexander's Abdallah is to be found more often in the pedigrees of Standardbred carriage horses than any other famous sire of trotters.

At the Blue Grass Fair in 1907, held at Lexington, Ky., there was an excellent exhibit of horses suitable to get American carriage horses. The class for mares 4 years old and over was won by Orinda (fig. 3). Orinda was sired by Logic, a Denmark-bred horse. Her dam was by Magic, already mentioned; second dam by Peavine; third dam by Stonewall Jackson; fourth dam by Walker's Grey Eagle. This pedigree shows Denmark, Thoroughbred, and Clay.

The second place in the class was won by Ahma, a daughter of Chester Lad, he by Chester Dare. Her dam was by Harrison Chief; second dam by Peavine; third dam by Cabell's Lexington. The pedigree shows Denmark on the sire's side almost to the exclusion of everything else, and on the dam's side Standardbred and Morgan.

Pedantic persons may express some astonishment at the idea of looking to a breed of saddle horses for carriage horses, but the records of the horses and their pedigrees given above are sufficient proof of the claim that the American Saddle Horse Register contains some of our best carriage blood, and that breeders who are using this

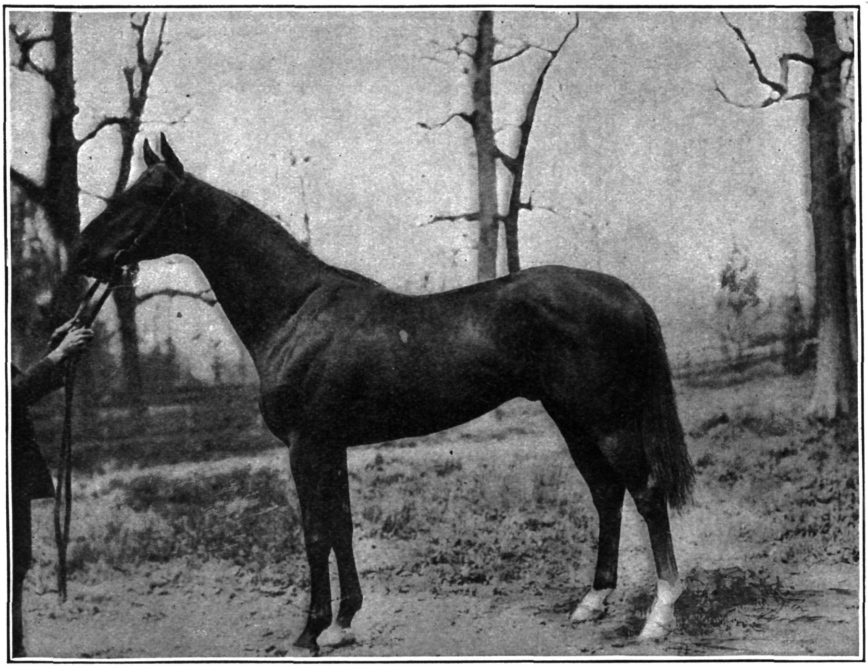


FIG. 6.—Disguise II. A noted sire of Thoroughbreds, and a very good type. The quality, finish, beautiful conformation, and great muscular development of the horse deserve special attention. This picture and the preceding one show how racing develops the "breediness" in horses. (Photograph by courtesy of Kentucky Farmer and Breeder.)

blood judiciously are acting wisely. Many of the sires which figure prominently in this line are registered also in the Morgan and Trotting registers.

THE STANDARDBRED AS A CARRIAGE HORSE.

In the foregoing remarks it is shown clearly that there are certain lines of breeding found in the Saddle Horse Register which can be relied upon to produce carriage horses. In Kentucky the breeding of horses for individual excellence of conformation, quality, and action

is carried to a greater degree than in any other State, and, contrary to popular opinion, the most of the men outside of the Thoroughbred establishments who make their living from horse breeding in Kentucky, in the Blue Grass counties at least, are breeding not for speed but for type. This has been going on for years, and for this reason the good, handsome horses of Kentucky have usually been appreciated, their history traced, and their descendants accounted for. If the same careful attention to points of conformation and action had been shown fifty years ago by Morgan breeders in New England, and had there been displayed the same enthusiasm for and loyalty to a

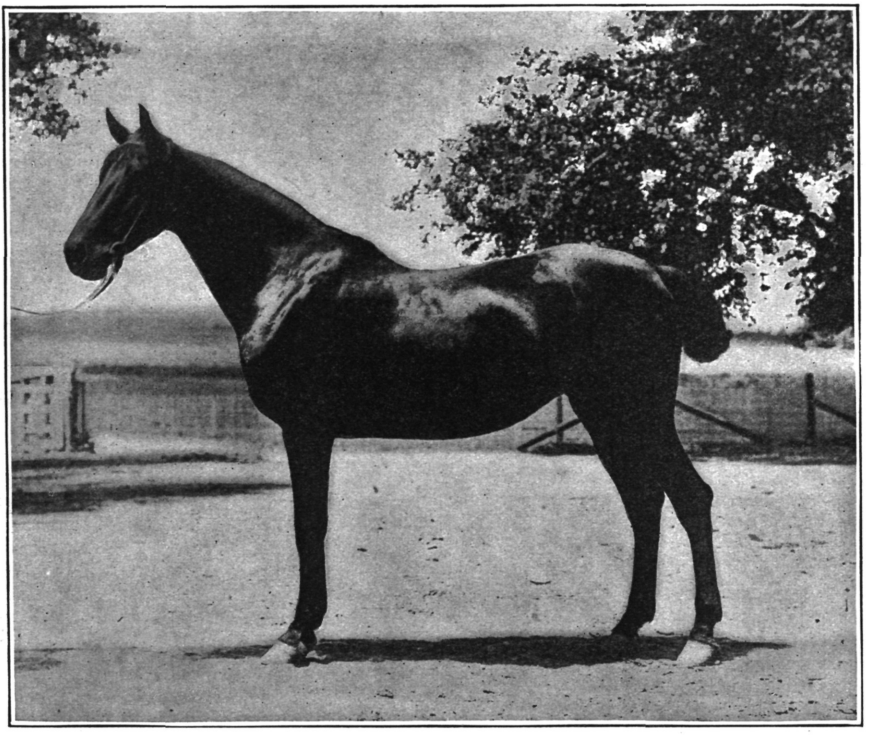


FIG. 7.—Kentucky. By Harrison Chief 1606 (S.); dam by Whirlwind; second dam by Peavine 85 (S.).

valuable local type of horses, there would now be no necessity for Government aid to save the Morgan from destruction. If horsemen in the limestone sections of the corn belt had paid less attention to the speed records of the stallions in their localities and more to their individuality, the carriage-horse work of the Department of Agriculture would be out of place.

In Kentucky it is not difficult to locate descendants of the horses to which reference has been made above, and in the pedigrees of carriage horses bred there it is easy to see a family relationship. When

we get outside that State, however, and trace the breeding of straight trotting-bred carriage horses, uniformity of breeding is, with certain important exceptions, unusual.

Reference has already been made to the fact that many of the best sires of carriage-horse lines in the Saddle Horse Register are registered also as Standardbred or Morgan. One, Indian Chief, is registered in all three books. One of the most prominent of such horses—Harrison Chief—appears in two registers, but has no claim to Morgan blood; neither has he any claim to Saddle Horse blood, if we rate him strictly according to the latest action of the American Saddle Horse Breeders' Association and assign to Denmark the exclusive honor of being the head of the Saddle Horse breed. Yet this horse adds value to almost any saddle pedigree, and his record as a sire of brood mares is remarkable. As a sire of fine carriage horses he has had few equals, and as the sire of Wilson's King he will be known as one of the great horses in American history.

Harrison Chief (see fig. 1) was bred by J. W. Cromwell, Cynthiana, Ky., and was foaled in 1872, dying in 1896. He was a bay with black points, 16 hands in height. His registration in the American Saddle Horse Register bears this editorial note: "He adds style, size, and speed at the trot, and great vigor in action generally." He is registered No. 1606 in the above register and No. 3841 in the American Trotting Register. Harrison Chief's sire was Clark Chief, by Mambrino Chief, he by Mambrino Paymaster, he by Mambrino, and he by the original Messenger. Harrison Chief's dam was Lute Boyd, a mare of great quality and finish that Kentuckians talk about to this day. She was by Joe Downing, by Edwin Forrest, and her dam was practically Thoroughbred. There are still Harrison Chief mares to be found, and as a rule they are bearing out the reputation of their sire as a getter of fine brood mares. This Department is fortunate in owning some of them.

The value of Harrison Chief as a sire of brood mares is even exceeded by his importance in horse history as the sire of Bourbon Chief and Wilson's King. Bourbon Chief has been famous for years as the sire of Montgomery Chief and Bourbon King, two of the greatest modern sires of saddle horses, and others of his get are notable saddle sires. He has also sired some excellent carriage horses. As a carriage-horse sire, Wilson's King was undoubtedly his superior.

King was bred by Wilson Brothers, Bethel, Ky., and was foaled in 1881, dying July 24, 1904. He was a chestnut, standing 16 hands. His dam was also the dam of Red Cloud, by Indian Chief, a horse which has left much good stock throughout the State. This mare was by Parsons's Abdallah, a son of Alexander's Abdallah, which fact, as already suggested, it is well to bear in mind in studying the carriage-horse possibilities of the trotter. The second dam was by

Yellow Jacket, a son of Wells's Yellow Jacket, breeding that is often found well back in good Saddle Horse pedigrees. Aside from this, however, King could not be called "saddle bred."

King's record in the stud was noteworthy. Like his sire, he was a great getter of brood mares, siring among others Annie C., the dam of Montgomery Chief and Bourbon King. He also sired Glorious Red Cloud, whose record as a show horse has been already mentioned. The sons and daughters of King are highly valued by breeders and can only be obtained at high prices. It is indeed fortunate that the breeding of this horse has been preserved to history by his registration in the Saddle Horse Register. Although he is almost entirely of trotting blood, it is doubtful whether he could have been registered as Standard in the American Trotting Register.

Among other horses to which reference should be made in this connection is Mambrino King, perhaps the most famous trotting horse ever exhibited in the breeding classes at the shows. He was sired by Mambrino Patchen, generally regarded to have been a son of Mambrino Chief, although Gen. John B. Castleman, president of the American Saddle Horse Breeders' Association, argues that Mambrino Patchen was really by Gaines's Denmark. The point is upheld by the opinion of many well-informed horsemen, but does not seem to be susceptible of positive proof, and until proved we must hold to the breeding as given in the Trotting Register. That gives the breeding of Mambrino King as follows: Chestnut, foaled 1872; bred by Dr. L. Herr, Lexington, Ky.; by Mambrino Patchen, son of Mambrino Chief; dam by Edwin Forrest.

Mambrino King was used at stud and shown in Kentucky, after which he was sold to the Village Farm, East Aurora, N. Y., in whose hands he won his greatest reputation. For several years the exhibit of Mambrino King and his get was a feature of the National Horse Show at Madison Square Garden, New York, and at the disposal of the stud in 1905 his influence was plainly seen in the finish and quality of his descendants.

Taking up the breeding of Standardbred horses in other States than Kentucky, we are struck with the frequent absence of uniform family lines on which to base sure calculations. A study of the pedigrees of noted trotting-bred carriage horses is interesting.

Let us take, for example, the pedigree of the horse Samuel Stone (shown under the name of Promoter). This horse was bred by Charles E. Waters, Minneapolis, Kans., and was by Norman Medium, he by Happy Medium. Norman Medium's dam was Alice Drake, by Alexander's Norman, by the Morse Horse, dam by Pilot, jr. Promoter's dam was Susie Clay, by Talisman, by Cassius M. Clay, jr., out of a daughter of Mambrino Chief; second dam Hazel Pulling, by Harry Pulling, he by Menelaus out of a mare by Smith's Ethan

Allen, a son of Vermont Black Hawk. The only lines in this pedigree which from present knowledge we would expect to produce carriage type are the Mambrino Chief, Clay, and Morgan.

Drummer Boy, a horse of great quality, good conformation, and flashy action, was by C. V. B., by Ensign, by Enchanter, by Administration. Aside from this, little is known of his breeding. His dam was sired by Chicamauga, a horse "brought from the South during the war."

Lord Baltimore, the famous prize winner, traces in direct male line to Justin Morgan and other of the famous show horses descend from Morgan lines. Lord Baltimore was formerly known as Sharlock, and is a son of Greylock, by Harrison Gray. Greylock's dam traces to Ethan Allen in the male line.

A very famous horse in western show rings a few years ago was the Standardbred horse Warship, shown as Blaze o' Glory. This horse after a brilliant career was sold for $5,000. Blaze o' Glory was by Masterpiece, a son of Masterlode by old Hambletonian. Masterpiece was out of a mare by Magna Charta, he by Morgan Eagle, a son of Hale's Green Mountain Morgan. Blaze o' Glory's dam was Jane B., by Lexington Chief, jr., he by Lexington Chief, a son of Kentucky Clay by Cassius M. Clay 22, out of Lady Warfield by Mambrino Chief. Lexington Chief, jr.'s dam was by Fiske's Mambrino, a son of Mambrino Chief. Jane B. was out of a mare by Magna Charta, the same horse which sired the dam of Masterpiece, Blaze o' Glory's sire. This pedigree shows a direct descent in the male line from Rysdyk's Hambletonian, but also inbreeding to Hale's Green Mountain Morgan, one of the best old Morgan sires. There are also two crosses to Mambrino Chief and one to Clay blood. The horse Morgan Eagle which appears twice in Blaze o' Glory's pedigree also appears in that of Glorious Whirling Cloud, mentioned below.

Glorious Whirling Cloud, shown as one of the "Glorious" four in which Red Cloud and Carmon also appeared, is registered as Don Edwood. He is a brown horse, 15.2 hands in height, weighing 1,140 pounds. He was foaled in 1892 and was bred by Martin L. Haines, Mount Holly, N. J. His sire was Don Ogden, by Kentucky Prince, a son of Clark Chief, the sire of Harrison Chief. Kentucky Prince was out of a mare by Morgan Eagle, a son of Hale's Green Mountain Morgan. Don Ogden's dam was by Electioneer; second dam by Mambrino Pilot. Glorious Whirling Cloud's dam was Electric Light, by Haven Star, a son of Conklin's American Star, by Seeley's American Star; second dam by Stephen A. Douglas, by Rysdyk's Hambletonian. This pedigree shows rather more than a usual amount of the carriage blood, if we may call it such. In fact, it is a very good pedigree from a carriage standpoint. One cross to Clark Chief and

Mambrino Chief and two to Morgan (granting Seeley's American Star to have been by Cock of the Rock, son of Sherman Morgan) would naturally tend to produce a carriage type. It is interesting to note that Glorious Whirling Cloud has been secured by the Iowa Agricultural College to stand during the season of 1908 at the college farm at Ames.

Sharing honors with Glorious Red Cloud as a show horse, Lord Brilliant is a horse whose castration was a mistake equaled only by that of the famous Hackney sire Forest King. Lord Brilliant won the Waldorf-Astoria cup three times, but only twice as the property of one exhibitor, for which reason it remained in the hands of the

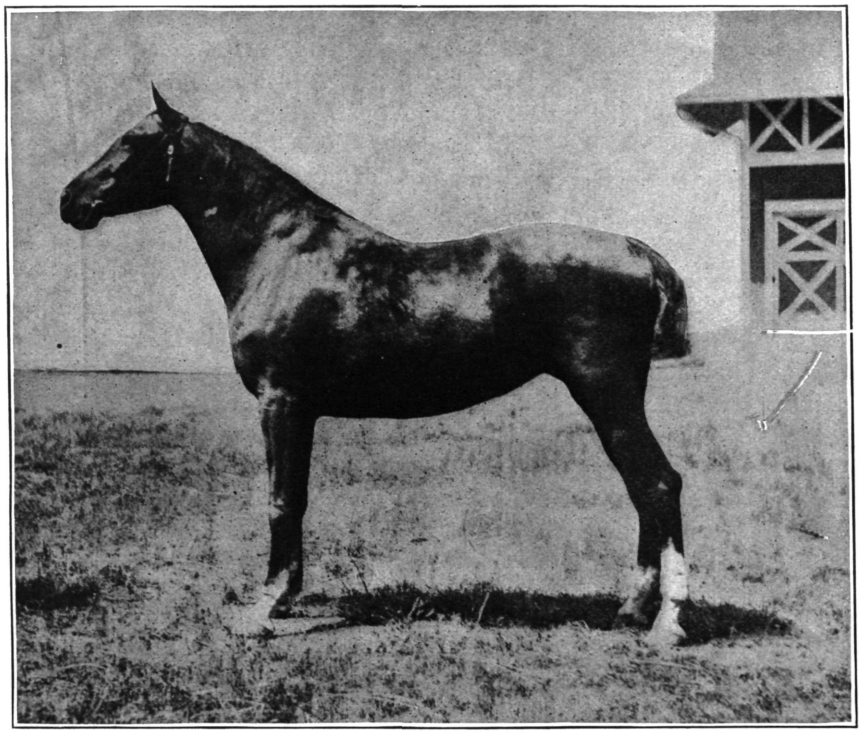


FIG. 8.—Washington. By C. H. Purcell 25226; dam by Clermont, a son of Red Wilkes.

horse-show association until finally won by Forest King. Lord Brilliant was by Johnnie Mack, he by Egmont, by Belmont, and he by Alexander's Abdallah. His dam was Barbara E., by Uh Wharie. The breeder of Lord Brilliant was I. N. Suter, Golden, Ill., a man whose reliability and honesty are vouched for. So far as blood lines go, Lord Brilliant's pedigree is notable in only one respect, but that a most important one—that his grandsire in the male line was Egmont, by Belmont, a son of Alexander's Abdallah.

The pedigree of Nala, champion heavy harness horse 15.2 hands or over at the 1907 New York show, is in doubt. The horse is said

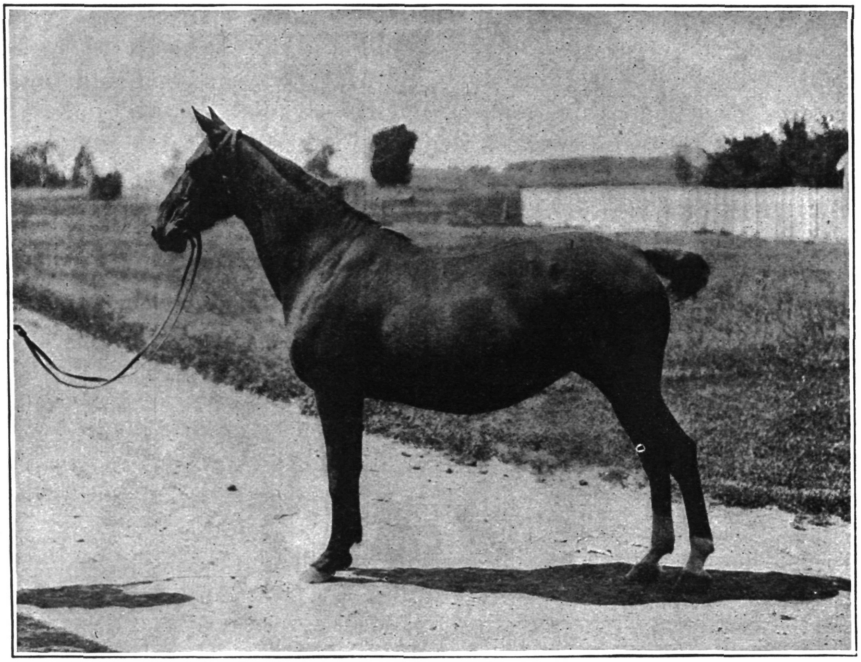


FIG. 9.—Michigan. By Prince L. 5947; dam by Temperance 6819.

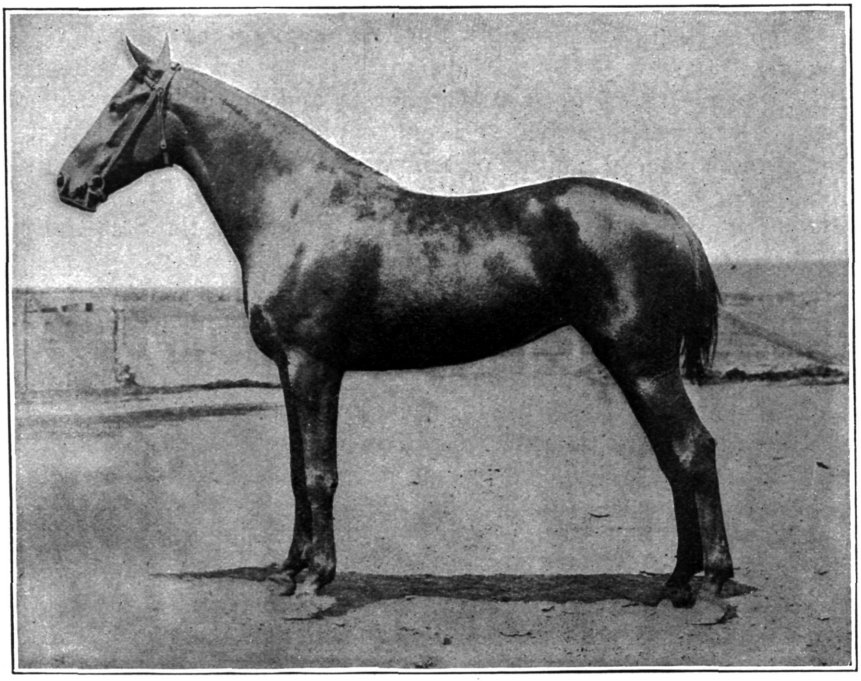


FIG. 10.—Georgia. By Norcatur 17855; dam Miami by Bay Star 11267.

to have been bred in Missouri, where he was known as Dave Telluride, and his breeding is given as follows: By George Telluride, he by Telluride, dam Eliza Jane, by Harkaway; second dam by France's Alexander; third dam by Pacing Abdallah, by Alexander's Abdallah. This pedigree sheds very little light on the carriage-horse problem. The crosses of Morgan, Clay, and Alexander's Abdallah are far back in the pedigree, and the Alexander's Abdallah cross is through a pacing son, and therefore not valuable.

The pedigree of Sir James, reserve to Nala at the 1907 New York horse show, is better known than that of Nala, although it does not run very strongly to the lines one would expect. Sir James was by Bow Bells, out of a mare by Red Wilkes, whose dam was by Mambrino Chief. It is interesting to note that an American trotting-bred horse known as Belford, now belonging to an English stable and said to have been shown successfully in England, is bred similarly, except that his dam was by Sentinel Wilkes instead of by Red Wilkes.

The important coincidence in most of these pedigrees is that almost invariably the names of various Morgan sires or of Alexander's Abdallah, Mambrino Chief, and sires of the Clay family appear. After a somewhat exhaustive study of the pedigrees not only of trotting-bred show horses especially, but of handsome Standardbred horses in general, the writer has reached the conclusion that, as a rule, when the famous Kentucky "saddle" lines do not appear, the blood of these families will be found; also that this blood is exceedingly valuable in producing good-looking horses, and that in the breeding of American carriage horses we must place a high value on it. Among more modern families certain Wilkes strains are coming into prominence, such as the sons and grandsons of Jay Bird. The results of the exhibition of American carriage horses at the State fairs will increase our knowledge on this subject.

THE WORK OF THE DEPARTMENT OF AGRICULTURE.

Specific work in horse breeding by the United States Government was first made possible by the inclusion in the appropriation act for the fiscal year ended June 30, 1905, of an item of $25,000 for experiments in animal breeding and feeding in cooperation with State agricultural experiment stations. This appropriation was made as a result of efforts on the part of Mr. Eugene H. Grubb, of Carbondale, Colo., a member of the Colorado State board of agriculture, and Prof. W. L. Carlyle, of the Colorado Experiment Station. When it became available the exact nature of the work to be undertaken was decided upon only after careful consideration. The Colorado interests were anxious to take up work in horse breeding, believing that the Colorado soil and climatic conditions provided excellent opportunities for the

production of horses of quality, substance, and great endurance. Finally, carriage-horse breeding was decided upon.[a]

The reasons for taking up the breeding of carriage horses have been fully set forth in other publications, in articles for the press, and in public addresses, but a recapitulation here may not be out of order. Briefly stated, they were: That carriage horses are as a rule the most valuable class on the market; that as a result of the strong demand the supply was gradually diminishing, and that notwithstanding all the importations of the carriage type from abroad, the preferred horse was the American horse. Most important of all, however, was the feeling that steps should be taken to correct the practice of castrating valuable stallions and selling valuable mares for other than breeding purposes. The Department also felt that, although probably nothing could wean the American horseman from his attachment to the Standardbred horse, the most useful characteristics of this horse should be preserved if it would continue to be of high value to the farmers of the country. A word upon this point will allay any fears that the Department intended a direct attack on the Standardbred horse as a speed producer. Using the latest figures available, the remarkable predominance of the Standardbred horse over all other breeds in America can be shown.

Up to June 30, 1907, 206,015 Standardbred trotters and pacers had been registered. These horses comprised more than one-half of the horses of all breeds registered up to that date and over 70 per cent of all the light horses registered, including Saddle Horses, Morgans, and Shetland ponies. If we eliminate the Saddle Horses and Morgans, and, therefore, all duplicates, more than three-fourths of all the light horses which have been registered in the United States have been Standardbreds. Some geldings are included in these figures, so that the number which have been available for breeding purposes is really somewhat lower, but it is probably counterbalanced by the fact that some horses which have made standard time are not actually registered in the American Trotting Register. No other breed begins to approach the Standardbred horse in popularity in the United States. In numbers registered the Thoroughbred and the Percheron are nearest to it, but neither has more than one-fourth the number.

[a] In addition to this, work was begun with the Alabama Experiment Station in southern beef production and with the Maine station in poultry breeding. Since that time the breeding and feeding experiments have developed so as to include, in addition to the above-mentioned work, Morgan horse breeding in Vermont, breeding gray draft horses at the Iowa station, breeding milking Shorthorns at the Minnesota station, feeding steers at the Missouri station, animal nutrition work at the Pennsylvania station, and breeding range sheep at the Wyoming station. The annual appropriation has been $50,000 since July 1, 1907.

In spite of this showing, which plainly indicates that the Standardbred horse is our national horse and that he is bred and handled by four times as many of our people as any other breed, the fact can not be overlooked that few persons can afford to breed a Standardbred horse solely for the speed which he may eventually develop. No line of stock breeding is so uncertain as breeding race horses—a fact shown emphatically by Wallace's Yearbook. To the close of 1907, 38,296 horses had made standard time (2.30 trotting or 2.25 pacing). This is only 18.59 per cent of the total number registered on June 30 of that year. Of this number, 11.29 per cent of the total were trotters and 7.30 per cent pacers. Everyone knows that a horse must make better than 2.30 to be really profitable on the track, and as a pacing horse is not in great demand except for matinee purposes and the race track, this leaves the breeder of Standardbred horses only about one chance in nine of getting a horse that even approaches being a profitable investment unless he has in mind some other breeding standard than speed. Using the figures for 2.10 horses in a similar way, we get a very fair idea of the chances of breeding a horse which, as a racer, is really profitable. To the close of 1907, 318 horses had made 2.10 trotting and 846 had made that time pacing, a total of 1,164. This number is only 0.57 per cent of the total number of Standardbred horses registered. Of all 2.30 trotters only 1.37 per cent have made 2.10 time, and of all 2.25 pacers the percentage is only 5.62.

It is a fact that there is a large number of horses whose records lie between 2.20 and 2.10 which yield a fair return on the investment, and it is probably true that some are made to pay whose best time is slower than 2.20. It is also true, however, that the relative number of 2.10 horses is measurably increasing, and of course the profit to be derived from slower horses is decreasing in direct ratio. The breeding of horses for speed is a business in which the chances are nearly all against the breeder. It is a game in which only the man of means can afford to indulge.

The purpose of these remarks is not to discriminate unjustly against the light-harness race horse. He has a valuable place in animal husbandry. As the Thoroughbred was developed in England, so are we developing the Standardbred in America, and we may reasonably expect the effect of this horse on American light stock to be similar to that of the Thoroughbred on the light breeds of Europe. Training, campaigning, and long selection for speed rapidly eliminate everything but the fittest, and we have as a result a hardy stock with great quality and stamina. Such a stock is able to transmit its quality and stamina when used judiciously on coarser native stock.

The figures quoted above, however, show emphatically that extreme speed in the Standardbred horse is, in the long run, his least valuable asset. It is his ability to improve the average run of light

horses and his inherent possibilities for the development of useful market types that make him most valuable to the farmer.

With the practice of castrating some of the most valuable trotting-bred stallions, constantly making more difficult the development of some of the most useful traits of the native horse, the value of the breed to the farmer was constantly being endangered. Until the Department undertook this work no one had made a consistent, systematic, and long-continued effort to improve and fix these qualities, and even trotting-horse men were prone to overlook the great value the breed possessed outside of its ability as a race horse. It was to save these valuable marketable characteristics and to show how the national horse could be made more valuable to the farmer that the Department undertook the work of developing a carriage horse from native material.

When this work was begun the ultimate use of foreign blood was considered a possibility. As the work has progressed, however, and greater knowledge has been gained of available blood lines and their characteristics, it has become clear that the probability of a resort to foreign crosses is very remote.

It is gratifying to those in charge of this work to know that already the attention of the farmers and breeders of the country has become strongly attracted to the more useful characteristics of the Standardbred horse. The argument that it is not possible for a carriage horse to be evolved from the Standardbred because the racing or roadster type and the carriage type are essentially antagonistic no longer carries much weight. That the carriage type is a prevalent one in the trotter can no longer be denied, and in view of our rapidly increasing knowledge of the breeding of carriage horses from trotting stock it is no longer denied that the production of the carriage type in our horses is more a matter of direct inheritance than of accident.

THE COLORADO WORK, BREEDING CARRIAGE HORSES.

The first purchase was made in December, 1904, from a Wyoming breeder by Messrs. Grubb and Carlyle, and comprised six mares in foal to a French Coach horse. The colts resulting from this mating were castrated, and, with the surviving fillies, will be sold during the present year, as the fillies will not be used by the Department for breeding. The second purchase was made in February, 1905, by a board composed of Prof. W. L. Carlyle, Director C. F. Curtiss, of the Iowa Experiment Station, and the Animal Husbandman of the Bureau of Animal Industry. Dr. D. E. Salmon, then Chief of the Bureau of Animal Industry, and Prof. W. M. Hays, Assistant Secretary of Agriculture, assisted. This purchase included the stallion Carmon (formerly shown as Glorious Thundercloud) and 12

mares, most of them bred in the corn-belt States and in Kentucky and nearly all of which had had a show-ring career. The next purchase was made in June, 1906, by Professor Curtiss and the writer, and included the mares Beatrice and Mambrina. Beatrice was sired by Highland Denmark, out of a daughter of Harrison Chief, and Mambrina is by King Lancelot, a son of Mambrino King, out of a daughter of Mambrino King.

The latest purchase was made in March, 1908, by the original pur-

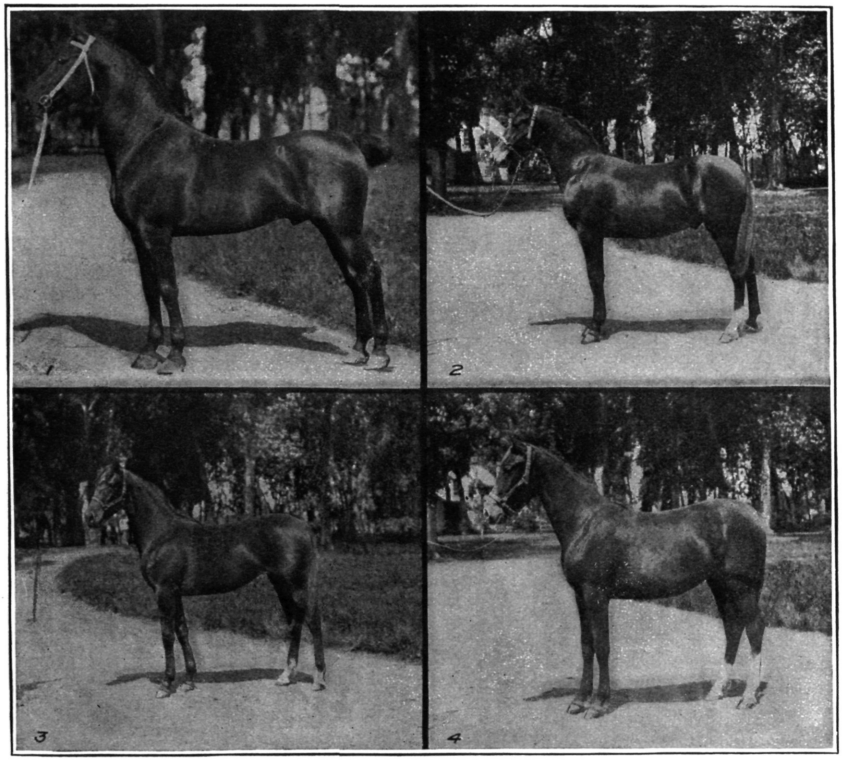


FIG. 11.—Uniformity in the get of a prepotent sire. Carmon and three of his first get in the Department's experiment in cooperation with the Colorado Experiment Station. Get photographed as yearlings. 1, Carmon; 2, Albion, dam Arizona; 3, Alba, dam Wyoming; 4, Annette, dam Iowa.

chasing board, and comprised four mares from different breeders in Kentucky. These mares were bred along lines shown in the foregoing pages to be excellent for the production of horses of the carriage type. Three were sired by Wilson's King and the fourth by Chester Dare, the grandsire of Ahma, second prize carriage brood mare at the 1907 Blue Grass Fair. Chester Dare was also the sire of Emma Briggs, already mentioned. The dams of these mares were sired by Wyatt's Red Cloud, Bourbon Chief, Sim's Clark Chief,

and Peavine. This is the best blood for the production of horses for carriage purposes which can be obtained in Kentucky at the present time. It is proved blood, and the addition of such stock to the stud is an experiment only in so far as any mating is an experiment. The mares were all in foal when purchased, and since the purchase all have foaled, one filly and three colts resulting. There are two colts by Bourbon King out of Barthenia McCord and Elvira Lindsay,[a] respectively, a filly by Cloud King out of Bethel Princess, and a colt by Golden King out of Golden Picture. The first two mares are to be bred back to Bourbon King and the last two to Golden King before being shipped to Colorado. It is the intention to breed them eventually to Carmon. That this will probably be a successful combination of blood lines is shown by the good results of mating Beatrice and Carmon. If the Harrison Chief and Denmark lines mate well with Carmon we may expect even better results when using the blood of Red Cloud and Peavine through the female lines. The use of daughters of Wilson's King is also regarded as a safe venture, in view of the excellent stock got by this horse. Many of his colts are to be found throughout the eastern Blue Grass counties, and almost without exception they show excellent carriage type and action.

In view of the fact that the blood lines represented in the purchase of the mares by Wilson's King are of the highest value for carriage production, there is no reason to fear that these mares will not produce satisfactorily. The use of strictly saddle blood, however, and the cross to horses which are, strictly speaking, saddle horses require a word of explanation.

When the carriage-horse breeding work was in its first stages, Ex-Secretary of Agriculture Norman J. Colman, the breeder of Carmon, suggested that the judicious use of saddle blood would probably be found desirable as a source of high finish and quality. Events have justified the prediction. The cross of Beatrice (by Highland Denmark, dam by Harrison Chief) to Carmon produced a foal of beautiful finish, conformation, and action. Although it is strictly saddle blood, Denmark blood is not, as a rule, natural racking blood. Highland Denmark was not a naturally racking horse, but racked only when forced to do so. The same can be said of Bourbon King. What is more, their progeny have, as a rule, a straight, true trot, with no inherent tendency to rack. That removes the usual objection to the use of strictly saddle blood in moderate amount in the production of carriage horses. In type, however, both of these horses would be classed as saddle horses, but the great quality and finish of this type are desirable in a carriage horse as much as in a saddle horse. By

[a] Since this article was written Elvira Lindsay's colt has died.

proper matings and selection we hope to eliminate the saddle type but retain the desirable finish and quality. The arguments for the use of a saddle cross, such as we obtain from Highland Denmark and Bourbon King, are similar to those that may be made for the use of a judicious amount of Thoroughbred blood. The type itself is not exactly what one would regard as ideal from a carriage point of view, but the finish and quality which are obtained more than offset this, and the proper adjustment of type can readily be accomplished by suitable selections in subsequent breeding.

In the mating to Golden King we have one that is excellent for carriage breeding. The horse is much more a carriage horse than a saddle horse, both in general conformation and in action. He also possesses abundant substance, quality, and finish. He is a son of Wilson's King, out of Indian Queen, a daughter of Wyatt's Red Cloud. Inheriting the well-known carriage characteristics of these families, Golden King is a promising sire of carriage horses. Like Highland Denmark and Bourbon King, he is a straight-line trotter and racks only when forced to do so.

In addition to the horses purchased by the Department, several mares have been presented to the Colorado station and placed in the stud subject to the same restrictions as the others.

The work is carried on in a strictly cooperative manner. Horses are purchased by the board already referred to, which represents the Department and the station, with a third member chosen by the Department with the approval of the station. With the exception of the gifts to the station all additions to the stud from the outside are paid for by the Department and remain its property, the Department paying the traveling expenses of the board and the per diem of the third member. The Department pays the entire salary of the head groom and a fair proportion of that of the expert in charge of the work. The station provides all buildings, improvements, and land as an offset to the cost of purchases. All other expenses are shared equally by the Department and the station. A careful compilation of expenses from the beginning shows that practically the same amount has been spent by each party, the Department's expenditure being slightly in excess of that of the station.

Under the terms of the agreement for the work foals bred after purchase become the property of the station, but the station may not sell them or use them for breeding except at the station without the approval of the Department. An option for the purchase of any and all progeny rests in the Department, and any funds derived by the station from sales and service fees must be used in the conduct of the work. Stallions may be used on mares owned by private individuals which are approved by the officer in charge.

STUD RECORDS IN COLORADO.

Three crops of foals have been sired by Carmon, including that of 1908. The record of the horse at stud and the produce records of the mares are given below as a matter of record.[a]

STALLION.

CARMON, b. h., 32917.

Bred by Norman J. Colman, St. Louis, Mo.; foaled, 1895; height, 16 hands; weight, 1,200 pounds. Sire Carnagie 8405; dam Monitor Maid, Vol. XI, A. T. R., by Monitor 1327. Purchased February, 1905.

Service record of Carmon, 1905–1907.

Year.	Mares served once.	Mares returned.	Total mares served.		Foals got.
			In experiment.	Owned by private citizens.	
1905	12	18	19	11	24
1906	17	15	21	11	15
1907	22	23	21	24	.....

In addition to Carmon, his son Albion, out of Arizona, is being bred to a few mares this year, and one mare was bred to Alva by Carmon out of Washington.

MARES.

ARIZONA, b. m.

Bred by George D. Rainsford, Diamond, Wyo.; foaled 1899; sire Emigrant; dam Hoyden, by Red Bud (Th.). Purchased December, 1904.

1906, April 9, b. c., Albion, by Carmon 32917.

1907, missed.

BEATRICE, b. m. 2079 (S.).

Bred by Gay Brothers, Pisgah, Ky.; foaled 1901; sire Highland Denmark 730 (S.); dam Lady Adams 2074 (S.). Purchased June, 1906.

1907, September 14, b. f., Belladonna, by Carmon 32917.

CALIFORNIA, br. m.

Height 15.3½ hands; weight 1,140 pounds. Purchased February, 1905.

1906, April 7, c., Apollo, by Carmon 32917.

1907, June 21, f. by Carmon 32917. (Destroyed; unsound.)

1908, June 9, b. f. by Carmon 32917.

[a] In giving registry numbers the following system is used to indicate the register in which any given number appears: Those in the American Trotting Register are printed open, thus: Carmon 32917. Those in the American Morgan Register are printed in parantheses, thus: General Gates (666). Those in the American Saddle Horse Register are followed by a capital S in parentheses, thus: Barthenia McCord 3223 (S.). Thoroughbred horses are designated thus: (Th.). The same system is followed in giving the stud records at the Morgan Horse Farm and in the pedigrees at the end of this article.

COLORADO, b. m.

Bred by George D. Rainsford, Diamond, Wyo.; foaled 1896; sire Emigrant; dam Hebe, a fine bay carriage mare, untraced.

1906, June 14, b. f., Amber, by Carmon 32917.
1907, June 9, f., Bernice, by Carmon 32917.
1907, November. Aborted.

DAKOTA, br. m.

1906, May 10, c., Archie, by Carmon 32917.
1907, May 19, c., Balfour, by Carmon 32917.
1908, May 5, b. c. by Carmon 32917.

FLORIDA, b. m.

Purchased February, 1905.

1906, May 28, f. by Carmon 32917; died at birth.
1907, May 24, c., Bijou, by Carmon 32917; died May 11, 1908; blood clot in heart.
1908, May 29, b. f. by Carmon 32917.

GAIETY GIRL.

1908, April 30, br. f. by Carmon 32917.

GEORGIA, b. m.

Bred by Walnut Park Farm, St. Joseph, Mo.; foaled 1900; height 15.1½ hands; weight 1,000 pounds; sire Norcatur 17855; dam Miami, by Bay Star 11267. Purchased February, 1905.

1906, April, f. Aborted.
1907, July 14, c., Ben Hur, by Carmon 32917.
1908, June 17, b. c. by Carmon 32917.

IDAHO, br. m.

Bred by George D. Rainsford, Diamond, Wyo., foaled 1899; sire Chugladdie; dam Hill Bud, by Red Bud (Th.).

1906, July 9, f., Amelia, by Carmon 32917.
1907, missed.

ILLINOIS, bl. m.

1906, April 20, c., Arden, by Carmon 32917.
1907, October 25, c., Brownie, by Carmon 32917; castrated June 13, 1908.

INDIANA, br. m.

Height, 15.1½ hands; weight 1,080 pounds. Purchased February, 1905.

1906, March 28, f., Alpha, by Carmon 32917.
1907, May 1, f., Bonita, by Carmon 32917.
1908, March 15, b. f., Clara, by Carmon 32917.

IOWA, gr. m.

Bred by Charles Haskins, Davenport, Iowa; sire, Judge Blair; dam by Forward 1961. Purchased February, 1905.

1906, March 5, f., Annette, by Carmon 32917.

1907, September 9, c., Bonnie Boy, by Carmon 32917.

KENTUCKY, br. m.

Bred by John T. Hughes, Lexington, Ky.; foaled 1892; height, 16 hands; weight, 1,215 pounds; sire by Harrison Chief 1606 (S.); dam by Whirlwind. Purchased February, 1905.

1906, February 27, f., Anita, by Carmon 32917.

1907, April 20, f., Belva, by Carmon 32917.

MAMBRINA, ch. m. 2400 (S).

Bred by Village Farm, East Aurora, N. Y.; foaled April 6, 1901; sire King Lancelot 32855 by Mambrino King 1279; dam Snowdrop 2398 (S.). Purchased June, 1906.

1908, April 27, ch. c. by Carmon 32917.

MICHIGAN, b. m.

Bred by C. J. Monroe, Bangor, Mich.; height, 16 hands; weight, 1,105 pounds; sire Prince L. 5947; dam by Temperance 6819. Purchased February, 1905.

1906, March 21, f., Ada, by Carmon 32917.

1907, September 12, b. f. by Carmon 32917.

MINNESOTA, ch. m.

Bred by James Gibbons of Ohio; foaled 1895; height, 16.1 hands; weight, 1,415 pounds; sire by Harrison Chief 1606 (S.); dam by Britton. Purchased February, 1905.

1906, February 27, aborted twins, by Carmon 32917.

1907, May 11, f., Boralma, by Carmon 32917.

1908, May 23, b. f. by Carmon 32917.

MONTANA, b. m.

Bred by George D. Rainsford, Diamond, Wyo.; foaled 1899; height, 15.3½ hands; weight, 1,150 pounds; sire Chappy, by Emigrant. Purchased December, 1904.

1906, missed.

1907, May 5, c. by Carmon 32917. (Destroyed; unsound.)

1908, May 13, b. c. by Carmon 32917.

NEVADA, b. m.

Bred by George D. Rainsford, Diamond, Wyo.; foaled 1899; height, 15.2 hands; weight, 1,085 pounds; sire Emigrant; dam Gila, by Red Bud (Th.). Purchased December, 1904.

1906, missed.

1907, missed.

1908, May 13, b. c. by Carmon 32917.

VIRGINIA, b. m.

Height, 15.3½ hands; weight, 1,225 pounds. Purchased February, 1905.
1906, April 4, f., Arba, by Carmon, 32917.
1907, May 13, f., Beula, by Carmon 32917.
1908, May 16, ch. f. by Carmon 32917.

WASHINGTON, ch. m.

Bred by a Mr. Rodgers, Lebanon, Ohio; foaled 1899; height, 16.1½ hands; weight, 1,200 pounds; sire, C. H. Purcell 25226; dam by Clermont, by Red Wilkes 1749. Purchased February, 1905. Died from rupture of blood vessel September, 1907.
1906, March 23, c., Alva, by Carmon 32917.
1907, March 18, c. by Carmon 32917. Died at birth.

WISCONSIN, b. m.

Bred by August Uehlein, Milwaukee, Wis.; foaled July 15, 1901; height, 15.1 hands; weight, 1,200 pounds; sire Messenger Wilkes 3743; dam a Phallas Chief mare by King Piedmont 10983. Purchased February, 1905.
1906, March 15, c., Avon, by Carmon 32917.
1907, September 5, c., Badger Boy, by Carmon 32917.

WYOMING, b. m.

Bred by George D. Rainsford, Diamond, Wyo.; foaled 1896; height, 15.3¾ hands; weight 1,180 pounds; sire Red Bud (Th.); dam Lady Shepherd, by Sparton, jr. Purchased December, 1904.
1906, May 28, f., Alba, by Carmon 32917.
1907, May 12, f., Bamba, by Carmon 32917.
1908, April 25, b. f. by Carmon 32917.

Carmon's record as a sire has been very satisfactory. He is a sure breeder and exceedingly prepotent. His colts have an abundance of size and, in many cases, splendid action. The matter of size in the American carriage horse is shown by the Colorado work to be one of good care and feeding as much as selection. The young stock at Fort Collins have all the size that could be desired. That point may be considered definitely settled.

THE VERMONT WORK, BREEDING MORGAN HORSES.

The first suggestion that the Department of Agriculture take steps to save the Morgan horse from extinction came from the late Senator Redfield Proctor, chairman of the Senate Committee on Agriculture, and was made in 1904 shortly after the passage of the original appropriation for cooperative breeding and feeding experiments. The influences that were slowly driving the Morgan to the wall have been discussed previously, as well as the value of the blood to the horse stock of the country. However, the Morgan type and Morgan blood lines still exist, not only in Vermont but in Illinois, Missouri, and other States.

Morgan breeding was arranged for in cooperation with the Vermont Experiment Station in the fall of 1905, on the farm of the station. No purchases were made, however, until June, 1906, when seven mares and two fillies were purchased from various persons in Vermont by a board composed of Mr. Cassius Peck, of the Vermont Experiment Station, Professor Curtiss, and the Animal Husbandman of this Bureau. The mares were in foal at the time of purchase or were bred immediately thereafter. In making the selections for the Morgan stud the effort was made to get the true Morgan type with an increase in size and quality over that possessed by the old Morgan. However, type was not sacrificed to size. When it was necessary to

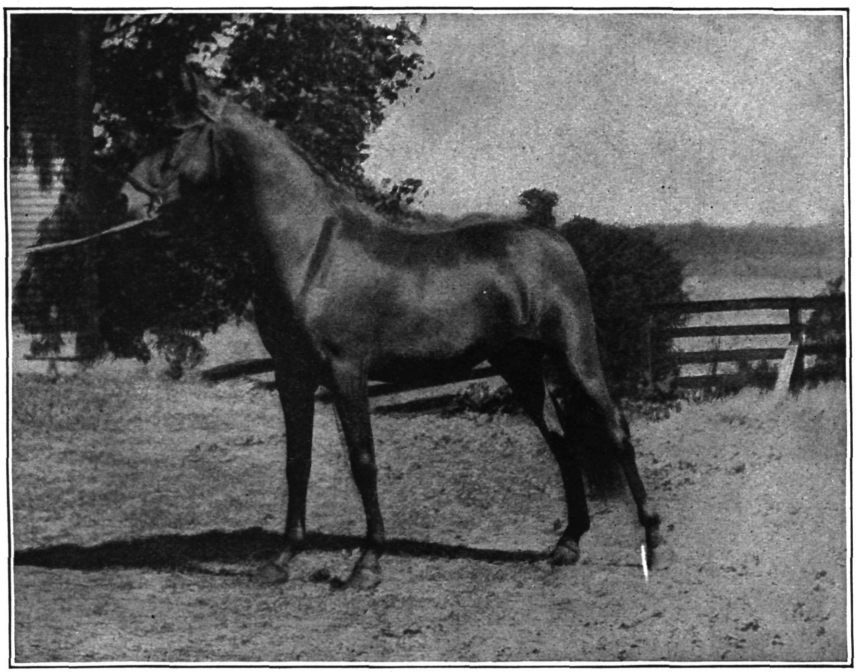


FIG. 12.—Lillian Gates. By General Gates; dam Caroline by Daniel Lambert. (Photograph taken as a 2-year-old.)

go below the prescribed size to get the desired type this was done. The Department advertised for mares described as follows:

They should be from 5 to 8 years old, standing 15.1 to 15.3 hands, and weighing 1,000 to 1,150 pounds. Colors preferred, brown, bay, or chestnut; grays or blacks should not be submitted unless they are exceptionally good individuals. Mares submitted for inspection should be sound, with good conformation, style, and action, and a pure trotting gait. They should be well bred along Morgan lines, but registration in the American Morgan Register will not be necessary for purchase.

Of the mares purchased in Vermont, all but three were registered or eligible to registration in the American Morgan Register.

After the purchases in Vermont Professor Curtiss and the writer spent some time in Kentucky and purchased two mares sired by Harrison Chief out of mares by Coleman's Eureka and Cabell's Lexington, respectively. This purchase was an experiment, its idea being based on the facts mentioned above and on the belief that a careful outcross, made by selecting blood of Harrison Chief on a Morgan foundation, would give increased size and quality without being violent and likely to destroy desirable type characteristics. One of the mares purchased in Kentucky—Mrs. Culvers—was in foal to Highland Denmark and dropped a filly of excellent Denmark type in 1907. The Kentucky purchase [a] has caused considerable comment on account

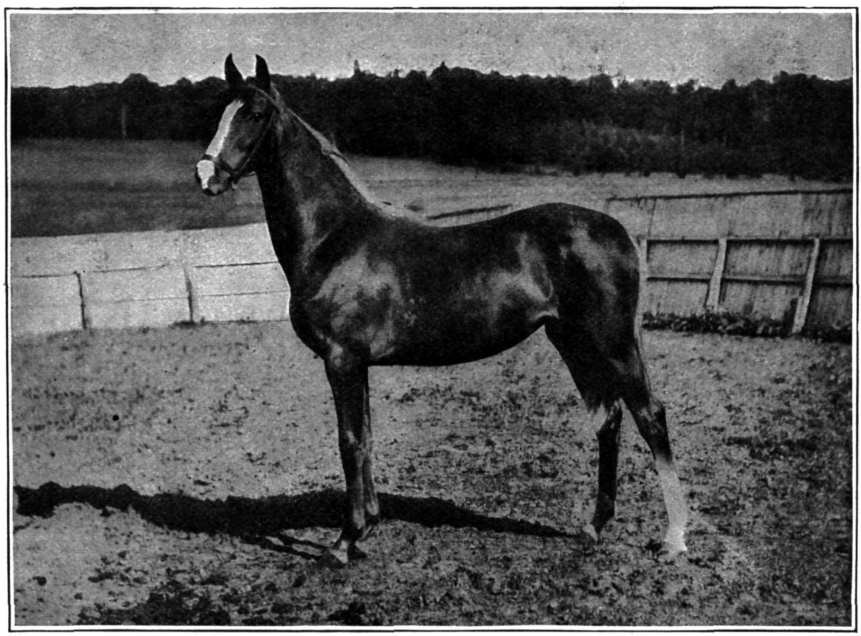


FIG. 13.—Helen. By General Gates; dam Caroline by Daniel Lambert. (Photograph taken as a yearling, on the day the filly was purchased by the Department.)

of its novelty, one critic going so far as to say that the Department was attempting to restore the Morgan type by the same method used to destroy it. Waiving comment on the critic's manifest lack of knowledge of the horse types and blood lines in Kentucky, it may be

[a] In addition to the purchase mentioned, one of the Vermont mares, Ianthe Hinds, was bred in the summer of 1907 to the young horse Battle Ax, who was sired by Montgomery Chief out of the mare Daisy Graves, the only filly foaled by the dam of Highland Denmark. Daisy Graves was by Allegro, a son of Ethan Allen, out of a granddaughter of Mambrino Chief. The result of this breeding was a filly foal.

pointed out that this cross is radically different from the cross of Standardbred and Morgan for the sole purpose of increasing speed. It was a speed craze, much more than a type craze, which did most to start the Morgan to destruction.

If the Kentucky breeders of fifty years ago found it to their advantage to go to Vermont for Morgan horses of good type to use on Kentucky stock, and if the use of those horses proved valuable, two things are, in the writer's opinion, made clear. First, that the Morgan blood is of the greatest value to the horse industry of the country;

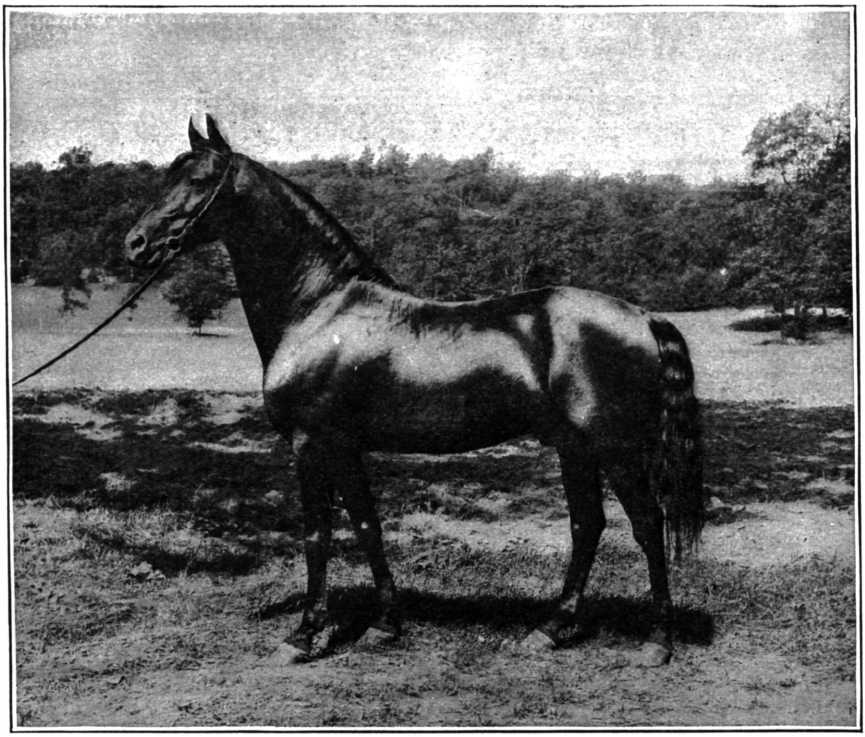


FIG. 14.—General Gates (666). At the head of the stud, U. S. Morgan Horse Farm, Middlebury, Vermont. A horse whose quality, good conformation, and prepotency make him a very valuable breeder.

and second, that the restoration of the Morgan can be greatly furthered by taking back to Vermont and other New England States some of the best of the descendants of the original New England stock and assisting in restoring the system of breeding to type which was abandoned with the development of the speed-at-any-cost idea. However, the Department is content to let the Kentucky purchase stand as an experiment, and will abide by the results.

The stallion General Gates and a filly out of one of the original

mares were purchased July 1, 1907. The filly is now 2 years old and is a very promising individual. General Gates was purchased after due consideration; the selection was made not only on his own individuality as a modern Morgan, but on his ability as a sire of the type desired. Few horses have greater prepotency than General Gates. Mated to mares of various types, he produces foals that are easily recognizable as being sired by him. He has stood in Addison County, Vt., for several years, and his get can be easily distinguished from those of other sires. His son Shakespeare was the champion Morgan stallion of all ages at the Louisiana Purchase Exposition, and his daughter Carrie Gates (now owned by the Department) was first at that show for 2-year-old mares.

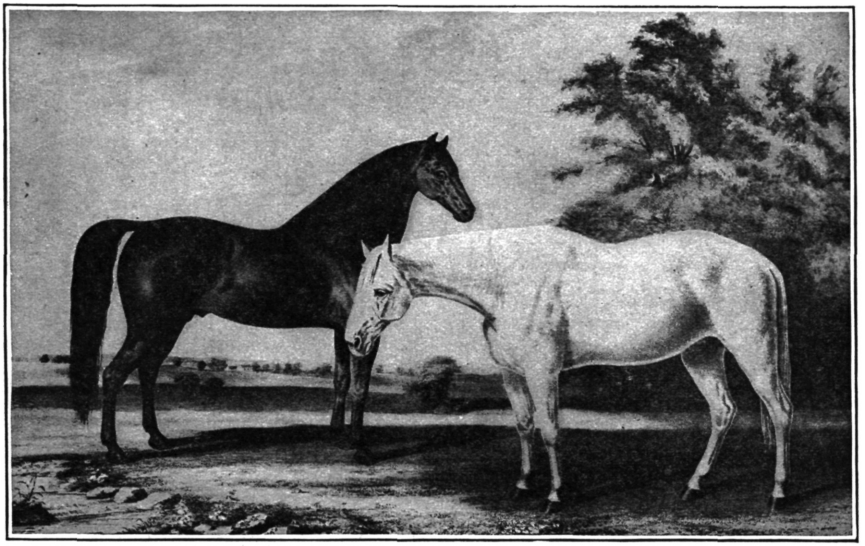


FIG. 15.—Vermont Black Hawk and Lady Suffolk. (The original of this illustration was a painting made in 1854, when both horses were at Bridport, Vermont. Black Hawk was 21 years old at the time. A comparison of the pictures of Black Hawk and General Gates will readily show the remarkable resemblance which the latter horse bears to his famous ancestor.)

General Gates is a black horse, bred by Joseph Battell, of Middlebury, Vt., and was foaled in 1894. He is 15 hands high and weighs 1,000 pounds in fair flesh. His sire was Denning Allen, he by Honest Allen, a son of Ethan Allen; General Gates's dam was Sallie Scott, by a Thoroughbred horse known as Revenue, jr., he by Revenue, he by imported Trustee, who is rated by Major Daingerfield, manager of the Castleton stud of James R. Keene, as one of the three greatest Thoroughbred horses imported during the nineteenth century.

Men who were well acquainted with Vermont Black Hawk declare that General Gates resembles him to a remarkable degree. In that

case the purchase of the horse for the Department's work was especially advantageous, for Black Hawk was one of the greatest Morgan horses of his time. He was not only a great individual, but was also a great sire, Ethan Allen, Stockbridge Chief (grandsire of Peavine), and Blood's Black Hawk (sire of Indian Chief and Gist's Black Hawk) ranking among his best sons.

The Thoroughbred cross in General Gates's pedigree needs little defense. According to the best information available, Justin Morgan himself had much more Thoroughbred blood than General Gates carries, and if we know anything at all about the breeding of the dam of Vermont Black Hawk it is that she was a "half-bred" mare. Gen-

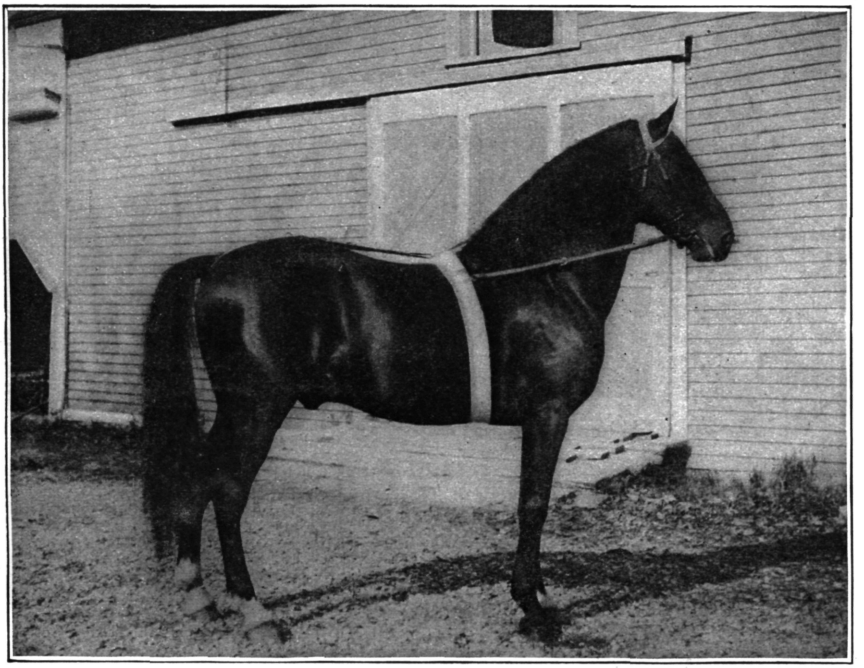


FIG. 16.—Kokane 40095 (5083). By Spokane; dam Revelyst by Revenue 1976. A Morgan sire of carriage type. (Photograph by courtesy of Gretna Farm.)

eral Gates is a Morgan in type without question; he reproduces his type in a uniform manner equaled by few stallions in the country, and much of the quality and finish in the horse and in his get are due to the Thoroughbred cross obtained through his dam. The value of the Thoroughbred in the development of the Saddle Horse in Kentucky is unquestioned, and even the strongest Kentucky partisans of the Saddle Horse admit the debt that the breed owes to the Morgan. The Morgans which were taken to Kentucky fifty years ago, such as Blood's Black Hawk and Butler's Eureka, proved of the greatest value when mated with the breedy mares of that State, and in Gen-

eral Gates, carrying about one-fourth Thoroughbred in his veins, we have a similar line of breeding when he is mated with the Morgan mares of Vermont, except that the Thoroughbred is on the male side.

The Thoroughbred cross, rationally and intelligently used, and selected strictly according to type, has always proved to be an advantage in the development of types of light horses. At least this has been true in England with the Hackneys, in France with the Demi-Sang, in Germany with the Trakhenen and similar breeds, and in Kentucky with the Saddle Horse. That it is also true in Vermont with the Morgan is shown, in the Department's judgment, by General Gates. Sole reliance, however, has not been placed on General Gates

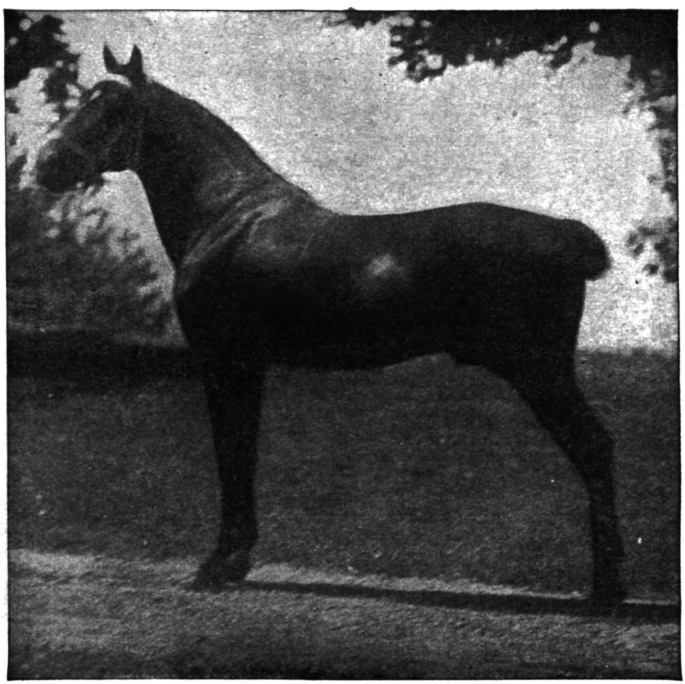


FIG. 17.—Rob Roy. By Ethan Allen 2d, a son of Peters' Morgan; dam by Starlight, a son of Flying Banner. A horse of excellent Morgan type.

as a sire. Of the original mares purchased, several were bred to other stallions, and in 1907 five mares were sent to other stallions. A few mares have also been bred outside this year.

The latest purchase for the Morgan work was that of two mares, Carrie Gates and Marion Gates, in October, 1907. These mares, as their names indicate, are both daughters of General Gates. Carrie Gates is a full sister to Shakespeare and Helen Gates, the latter one of the fillies in the Department stud.

The work in Vermont was given a great impetus early in 1907 by the presentation to the Department by Mr. Joseph Battell, of Middle-

bury, Vt., of a 400-acre farm, on which the work could be carried on to better advantage than on the farm of the Vermont Experiment Station at Burlington, where the soil is very sandy and not entirely suited to horse breeding. The farm is located about 2 miles from the village of Middlebury and lies along the west side of Otter Creek. It is underlaid with limestone, with occasional outcrops. It is also well timbered. The property is improved with two houses, two barns, and the usual outbuildings. Since the Department acquired the property considerable fencing has been done, paddocks have been

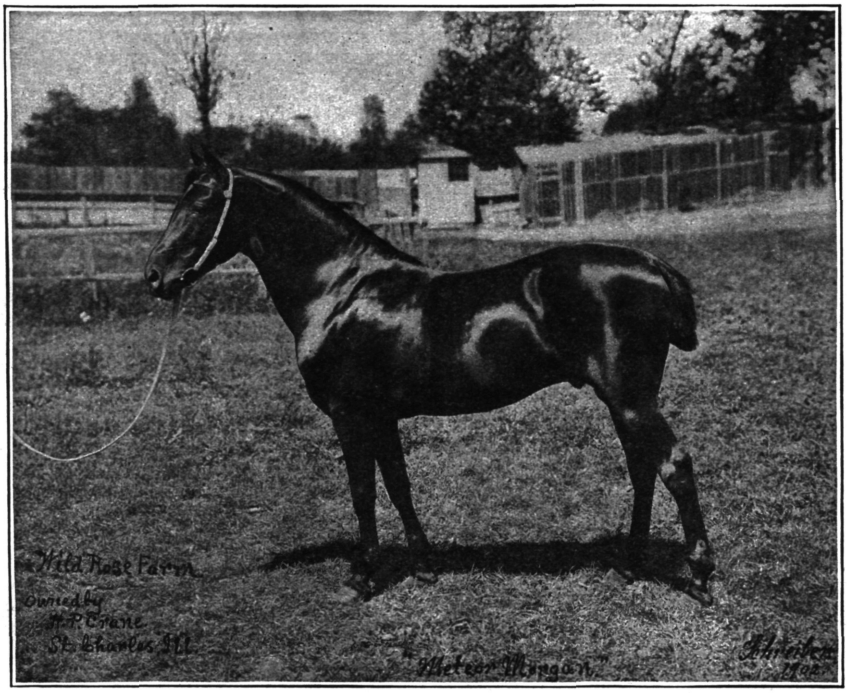


FIG. 18.—Meteor Morgan. Registered as Meteor 2d (4459). By Meteor; dam by Winnebago Chief. A modernization of the strictly Morgan type. A horse of excellent style, quality, and conformation. (Photograph by courtesy of Wild Rose Farm.)

built, and the superintendent's house and main barn remodeled and repaired. All the horses are now located at this farm, the plant at the Vermont station being held in reserve as a possible substation in future.

The stud being located on the Department's property, the arrangement for the cooperation in the Vermont case is somewhat different from that in Colorado. It is cooperative, however. The station shares in the annual maintenance expense, in return for which it is given title to five foals annually. A station officer (Mr. Cassius Peck) assists in the management of the farm. The same restrictions

upon the station in the Colorado work regarding progeny hold in the agreement with the Vermont station. The stallion may be used on outside mares approved by the superintendent of the farm, Mr. W. F. Hammond.

STUD RECORDS IN VERMONT.

Only two crops of foals have been obtained in the Morgan work, and only in the latest (1908) were all the foals dropped at the Morgan Horse Farm. The breeding season of 1907 was unfortunate, in that four of the five mares which were sent away to be bred failed to be in foal. As the Department has owned General Gates only

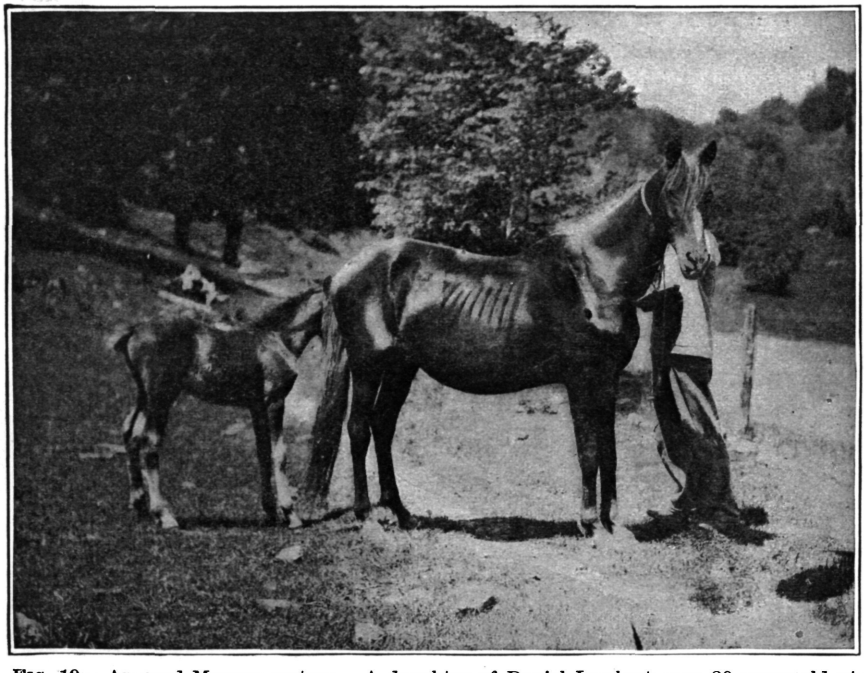


FIG. 19.—An aged Morgan matron. A daughter of Daniel Lambert over 20 years old at time photograph was taken in 1906. The mare is still producing. Note the quality shown by both mare and foal.

since July 1, 1907, we have not a complete stud record for him. The produce records of the mares are given below:

BABE, ch. m., Vol. III, A. M. R.

Bred by Sim Dunn, Burke, Vt.; foaled, July 22, 1899; height 15.2 hands; sire Bob Morgan (4549). Purchased June, 1906.

1907, br. c. by Frank Allen (4694). Castrated, 1908.

1908, missed.

ELLEN, ch. m., Vol. III, A. M. R.

Bred by E. J. Goodyear, Hancock, Vt.; foaled June 28, 1895; height 15.2 hands; sire Rocky Mountain (3914). Purchased June, 1906.

1908, April 20, ch. f. by General Gates (666).

HARRISON BELLE, ch. m. 3712 (S.).

Bred by J. W. Cromwell, Cynthiana, Ky.; foaled 1895; height 15.0½ hands; sire Harrison Chief 1606 (S.); dam by Coleman's Eureka (451). Purchased June, 1906.

1908, March 15, bl. f., Isabel Gates, by General Gates (666).

IANTHE HINDS, b. m., Vol. III, A. M. R.; Vol. XIV, A. T. R.

Bred by E. D. Hinds, Pittsford, Vt.; foaled June, 1894; height 15 hands; sire Young Ethan Allen 2384 (3658); dam Twilight by Daniel Lambert 102 (62). Purchased June 12, 1906.

1908, June 5, ch. f. by Battle Ax (5221), 2435 (S.).

KIT BEATTY, br. m.

Bred by P. S. Emins, West Berkshire, Vt.; foaled June 18, 1893; height 15 hands; sire Harry Clay by Cassius M. Clay, jr., 20; dam Dolly by Young Pine. Purchased June, 1906.

1907, April —, stillbirth.

1908, April 11, b. c., Benjamin Gates, by General Gates (666).

LADY ALLEN, Vol. III, A. M. R.

Bred by E. C. Ryder, Vergennes, Vt.; foaled 1897; sire Denning Allen (74); dam Roxy by Daniel Lambert (62) 102. Purchased June, 1906. Destroyed April 2, 1908; unsound.

1908, missed.

MAGGIE, ch. m.

Foaled about 1892; height 15 hands. Purchased June, 1906.

1907, June 2, b. f., Madge, by Rex.

1908, missed.

MRS. CULVERS, b. m., 3711 (S.).

Bred by Charles McElwain, Bowling Green, Ky.; foaled 1895; height 15.1 hands; sire Harrison Chief 1606 (S.); dam Belle by Cabell's Lexington (1223). Purchased June, 1906.

1908, April 3, b. c., Harrison Gates, by General Gates (666).

POLLY B., b. m.

Bred by D. F. McCauley, Shoreham, Vt.; foaled June 19, 1900; height 15.2 hands; sire Gillig 14258 (3869). Purchased June, 1906.

1907, June 9, bl. f., Polly's Baby, by General Gates (666). (Twins, colt and filly; colt dead at birth.)

Carrie Gates and Marion Gates were bred in the spring of 1908 to Lambert B., a son of Daniel Lambert.

A full sister to Helen—Lilian Gates—was purchased at the same time, but died suddenly two or three months thereafter. A filly out

of Kit Beatty (purchased with dam) died in December, 1907, of tetanus. A filly out of Lady Allen, purchased in utero, was destroyed on account of unsoundness.

The aim of the stud at Middlebury is to preserve the Morgan type at its best, keeping the splendid conformation, spirit, and endurance for which these horses are famous, and eliminating the tendency to coarseness, heavy withers, and low backs. A careful effort will also be made to improve the action by getting away from the choppiness and irregularity in gait, and particularly by eliminating the tendency to pace and mix gaits. Size will be increased carefully by selection, but it is not our purpose to make the Morgan a big horse. A size ranging from 15.1 to 15.3 hands is sufficient, with about 15.2 as the ideal. However, this will not by any means disqualify a 15-hand horse or one even somewhat smaller, provided he has desirable characteristics of conformation, quality, and action. It should be clearly understood that the work with the Morgans is not to be merged into that with the American carriage horse. Although the Morgan always has been and probably always will be a prime factor in the production of carriage horses, the type should be kept distinct.

CLASSIFICATION FOR AMERICAN CARRIAGE HORSES.

As a coordinate line of work with the carriage-horse breeding work, the Department, in cooperation with the American Association of Trotting Horse Breeders, has formulated a classification for American carriage horses, the adoption of which has been presented to State fair authorities with gratifying success.

The adoption of such classifications by the fairs was obviously a matter to follow soon after the inauguration of the work in Colorado, and in 1907 the Iowa State Fair, through the influence of the superintendent of the horse department, Professor Curtiss, provided such a classification. Soon after the action taken by the Iowa board the Blue Grass Fair in Kentucky adopted a similar classification. The Kentucky State Fair also offered prizes for one class at the 1907 fair. All had the same object in view, but they differed in quite important details. Recognizing the importance of a uniform and general classification, Mr. A. T. Cole, of Wheaton, Ill., who for several years has been studying the carriage possibilities of the American horse, and who has been breeding along definite lines to this end, interested the American Association of Trotting Horse Breeders in the matter, and in May, 1907, called at the Department on behalf of the association to request the cooperation of the Department with the association in providing a classification for general use.

The suggestion was favorably received, and, although the work was started late in the year, two fairs adopted the classification in complete form—the Kansas State Fair, held at Hutchinson, and the Interstate Fair and Exposition, held at Kansas City, Mo.

The classification at the Blue Grass Fair was worded " for horses fitted to produce American carriage horses," and comprised three classes—for stallions 3 years old and over; for mares 4 years old and over which have produced a live foal, and for mares 4 years old and under which have not produced a live foal. Two premiums were offered in each class. The exhibits were quite creditable, especially in the mare classes.

At the other fairs the quality of the animals, although not all that could be desired in all cases, was as good as could be expected, and there is every reason to be gratified at the showing made. In an educational movement like this we may expect improvement from year to year.

The efforts of the Department to bring about a general adoption of the classification for the 1908 fairs surpassed expectations. Eleven State fairs have adopted it in whole or in part: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Ohio, Tennessee, Washington, and Wisconsin. It was also adopted by the management of the Tri-State Fair, to be held at Memphis, Tenn. Others are considering its adoption and the matter is exciting considerable interest among county and district fairs. The Blue Grass Fair has retained the same classification and specifications as for 1907 on account of the special system of showing in vogue.

The cooperative arrangement between the Department and the American Association of Trotting Horse Breeders is made effective by the organization of a committee on heavy harness horses in the association to represent the Department, the Morgan breeders, the saddle-horse breeders, and the trotting-horse breeders. The committee is composed of the Animal Husbandman of the Bureau of Animal Industry, chairman; Mr. Maxwell Evarts, New York, N. Y., a member of the American Morgan Register Association, and president of the Vermont State Fair; Gen. John B. Castleman, Louisville, Ky., president of the American Saddle Horse Breeders' Association; Mr. A. T. Cole, Wheaton, Ill.; Prof. Charles F. Curtiss, director of the Iowa Agricultural Experiment Station, Ames, Iowa, and a member of the horse-purchasing board of this Department, and Mr. H. K. Devereux, Cleveland, Ohio, a well-known trotting-horse man and secretary of the American Association of Trotting Horse Breeders.

The widespread adoption of the classification is of the greatest importance to the carriage-horse movement at this time and to

farmers and breeders who own horses suitable to get American carriage horses, for the reason that the fairs are in very close touch with farmers, also that the farmers are the breeders of most of the carriage horses sold on the American market, and that by means of exhibits at the fairs farmers can be rapidly educated to appreciate the value of the American horse for carriage purposes. With the powerful influence of the fairs and stock shows thrown into the solution of the carriage-horse problem, the farmer will not only learn to appreciate the intrinsic value of the native light horse as a carriage horse, but will recognize the worth, as a sire of such horses, of a stallion that has good conformation and quality, but only moderate speed. The problem of fixing the type will then be one of early solution.

The classification is as follows:

TYPE.

The type desired for the American carriage horse is as follows: Not under 15 hands for mature horses; smooth, compact, and symmetrical conformation; neck of good length, inclined naturally to arch; sloping shoulders; well-set legs of medium length; sloping pasterns and good feet; short, strong back; well-sprung ribs well ribbed up to coupling; smooth loins; full flanks; straight croup, with well-set tail; full, round quarters.

CONDITIONS GOVERNING ENTRIES.

Classes open only to horses of American blood.

Stallions in classes 1 to 5, inclusive, must be registered either in the American Trotting Register as standard, in the American Morgan Register, or in the American Saddle Horse Register, and certificate of such registry must be shown in the ring if required.

Entries in all classes for mares must be registered either in the American Trotting Register as standard or nonstandard, in the American Morgan Register, or in the American Saddle Horse Register, and certificate of such registry must be shown in the ring if required.

Entries as get of sire in class 5 and produce of mare in class 10, and entries in class 11 must be sired by a stallion registered as above, out of mares registered as above.

No mare having any draft cross will be eligible.

Any exhibitor falsifying the breeding of entries will be barred.

Entries in all classes must be practically sound.

JUDGING.

Entries in all classes to be judged on conformation, style, action, and manners as a suitable type of carriage horse. Special attention will be given to trueness of action. Good knee and hock action are essential. Entries in all classes should trot and walk straight and true, and judges will especially avoid horses showing any tendency to pace, mix gaits, paddle in front, or sprawl behind.

The following percentages will govern judges in classes 1, 2, 3, 4, 6, 7, 8, 9: General conformation and all-round suitability as a carriage type, 60 per cent; style, action, and manners, 40 per cent.

The following percentages will govern in class 5: General conformation and all-round suitability of sire as a carriage type, 30 per cent; style, action, and manners of sire, 20 per cent; general conformation and all-round suitability of get as a carriage type, taken as a whole, 30 per cent; style, action, manners, and uniformity of type in get, 20 per cent.

The following percentages will govern in class 10: General conformation of dam as a brood mare of the carriage type, 50 per cent; general conformation, style, action, and manners of the foal, 50 per cent.

The following percentages will govern in class 11: General conformation of entry as a carriage type, 70 per cent; style, action, and manners, 30 per cent.

MANNER OF SHOWING.

Entries in classes 1, 2, 6, and 7 to be shown in harness, hitched to any suitable vehicle. Entries in all other classes to be shown in hand to bridle or halter. Excessive weight in shoeing in any class is forbidden.

CLASSES.

Class 1. Stallion 4 years old or over.
Class 2. Stallion 3 years old and under 4.
Class 3. Stallion 2 years old and under 3.
Class 4. Stallion 1 year old and under 2.
Class 5. Stallion with three of his get of either sex; get need not be owned by exhibitor.
Class 6. Mare 4 years old or over.
Class 7. Mare 3 years old and under 4.
Class 8. Mare 2 years old and under 3.
Class 9. Mare 1 year old and under 2.
Class 10. Mare and foal of either sex.
Class 11. Foal under 1 year old, either sex.

The blood lines specified for these classes have caused some comment. They were chosen in view of the facts already set forth in this article, that nearly all our good American carriage horses are bred in certain lines found either in the American Trotting Register, the American Morgan Register, or the American Saddle Horse Register, or in two or all of these registers. The development of the American carriage horse is first of all a matter of wise selection of type; selection of pedigrees can only come when it is definitely established what blood lines produce the type desired. Within certain limits we know this already, but we do not know all the carriage-producing lines of the American horse, and the acquirement of this knowledge as soon as possible is desirable. By the exhibitions at the fairs breeders can soon be shown what is the desired type, and by studying the pedigrees of the horses winning in the American carriage-horse classes the definitely producing blood lines will soon become known.

The responsibility of judges acting under these specifications is apparent. Not all horses registered as prescribed will be desirable individuals to which to give a premium. In each one of the registers

named there can be found many good producing lines and many suitable individuals, but there are more which are not such. With wise judging there need be no more danger of a strictly saddle type winning than of a strictly racing type.

EXTENSION OF THE WORK DESIRABLE.

The development of the work of improving and fixing our native types of horses should not be allowed to stop after the auspicious start which has been made. Although the Department believes that very rapid development would be highly undesirable, a gradual growth and extension is needed. Extensions of the work should be made into other States, the one most important and desirable at this time being the establishment of a breeding station in Kentucky, located in the blue-grass region, whence come so many fine carriage horses. This should be sufficiently extensive to enable representatives of the best Kentucky blood lines to be reared on their native soil.

CONCLUSION.

In the Department's work the individuality of a horse is the point given greatest weight in his selection, and strict selection to type is the policy in view. Wherever possible (as in the last Kentucky purchase), the inheritance of type has been combined with the selection of type in the individual, and naturally an animal that inherits good individuality from his ancestors and is himself a good individual is much more valuable for the Department breeding establishments than one without such an inheritance.

The close relationship of our native horse stock can be made to yield wonderful results if properly used. We have been prodigal with the blood of our fine horses, just as we have been prodigal with our forests; but it is not yet too late.

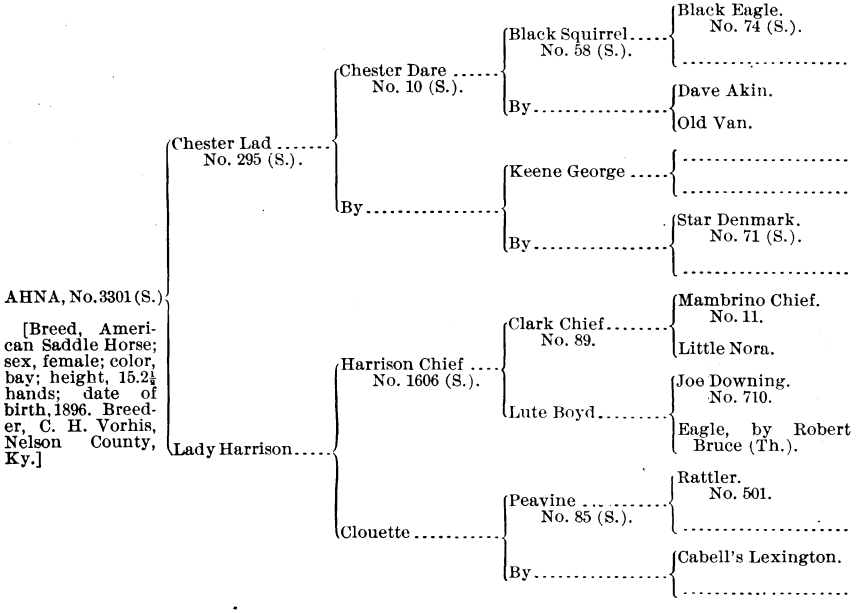
The Department does not seek to antagonize those men who are expending large sums of money annually in the breeding of horses for the race track. It believes that breeding for speed produces in the long run a horse which is of great value in the improvement of the average run of light horses, but the breeding of horses for the sole and specific purpose of speed production can not as a rule be followed by the average farmer with profit.

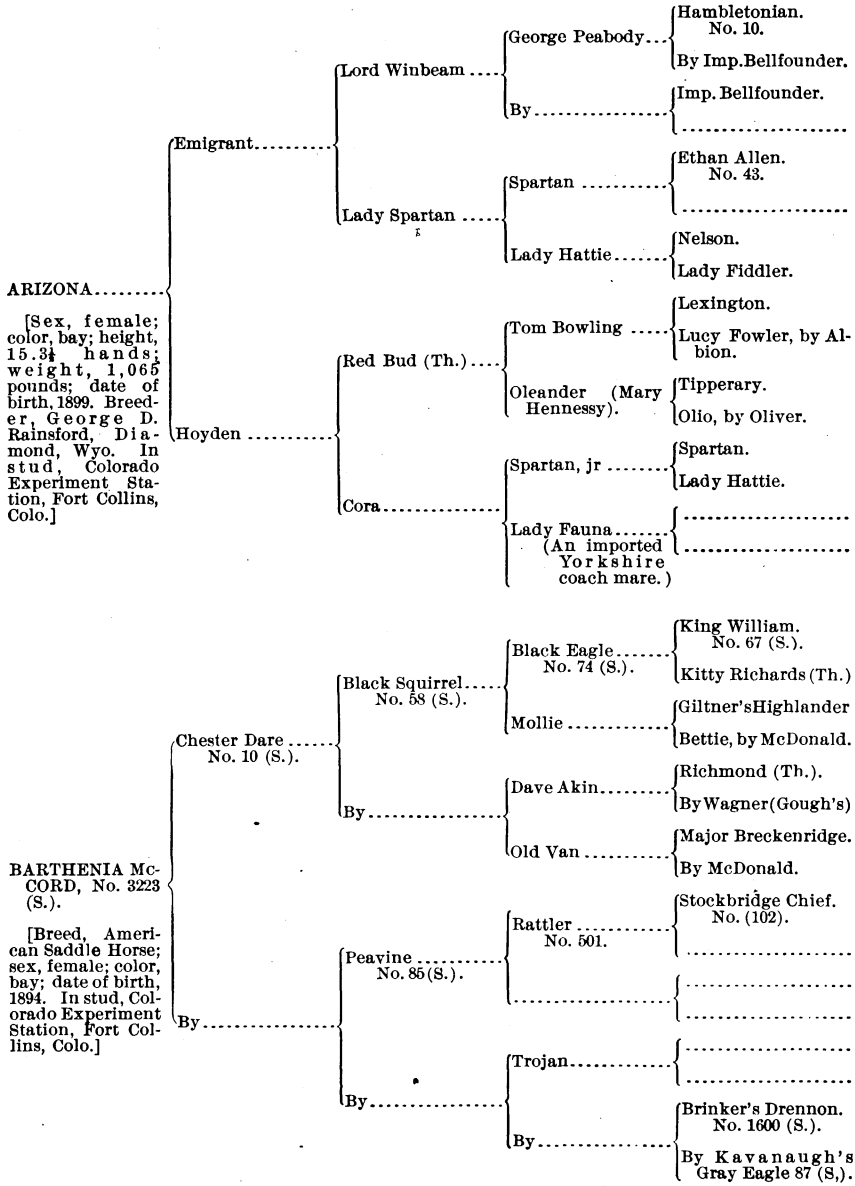
Neither does the Department wish to antagonize the breeders of "coach" horses whose origin is in other countries. Such horses have their place. What the Department does desire is to see the American horse given a fair chance not only in our markets but in our show rings and on our breeding farms. No one should deny him that; neither should one condone the policy of ruthless destruction which has been going on in the past and which has threatened the total extinction of native types.

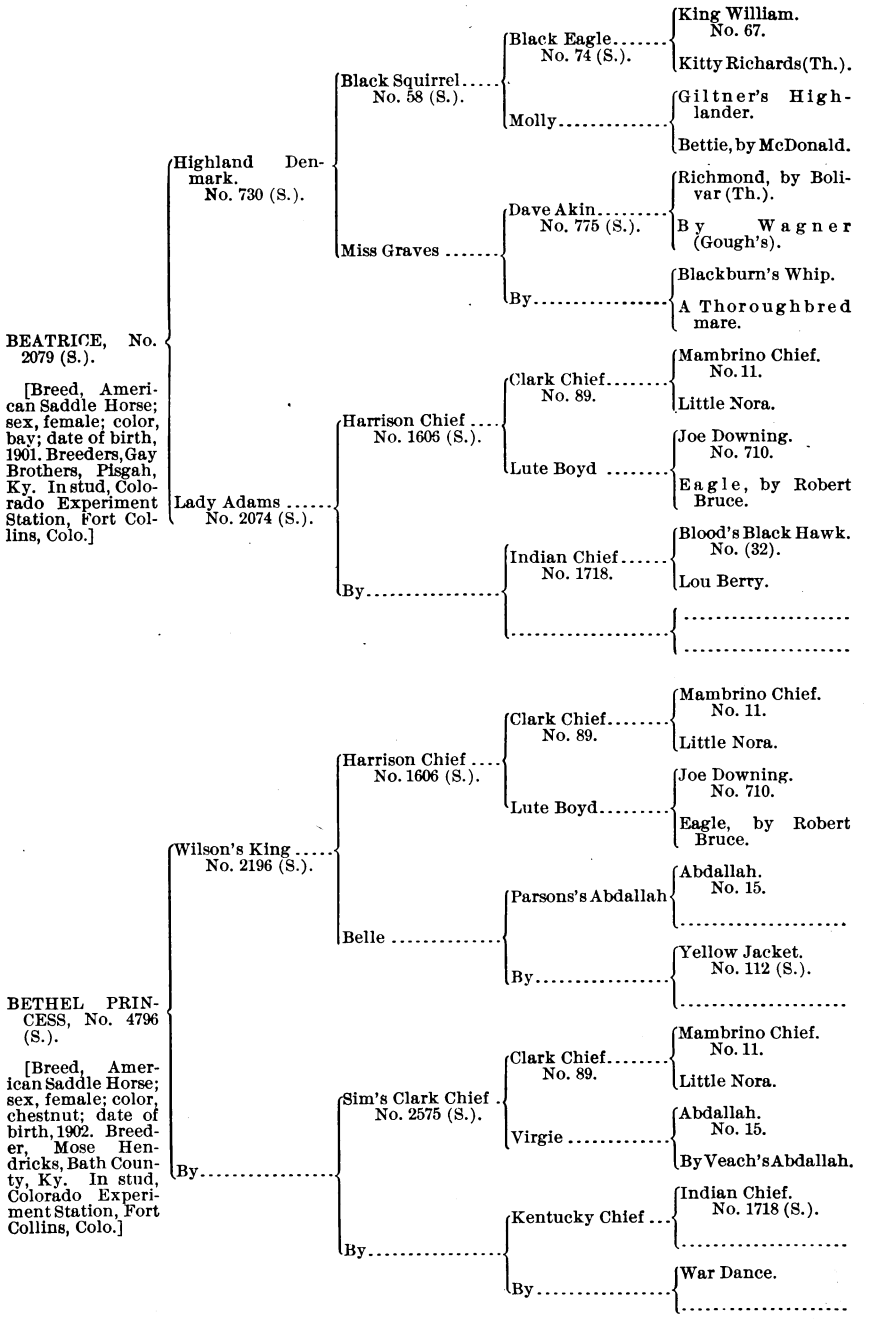
It is no patriotic fancy to urge that our native types of light horses should be preserved. It is not a fallacy to argue that out of these types can be evolved the horse par excellence for farmers and horsemen who prefer the light type. Neither is it paternalistic nor socialistic for the Federal Government to take a hand in this work. It is a national movement, requiring a national policy to insure uniformity, concentration of effort, and continuity of purpose.

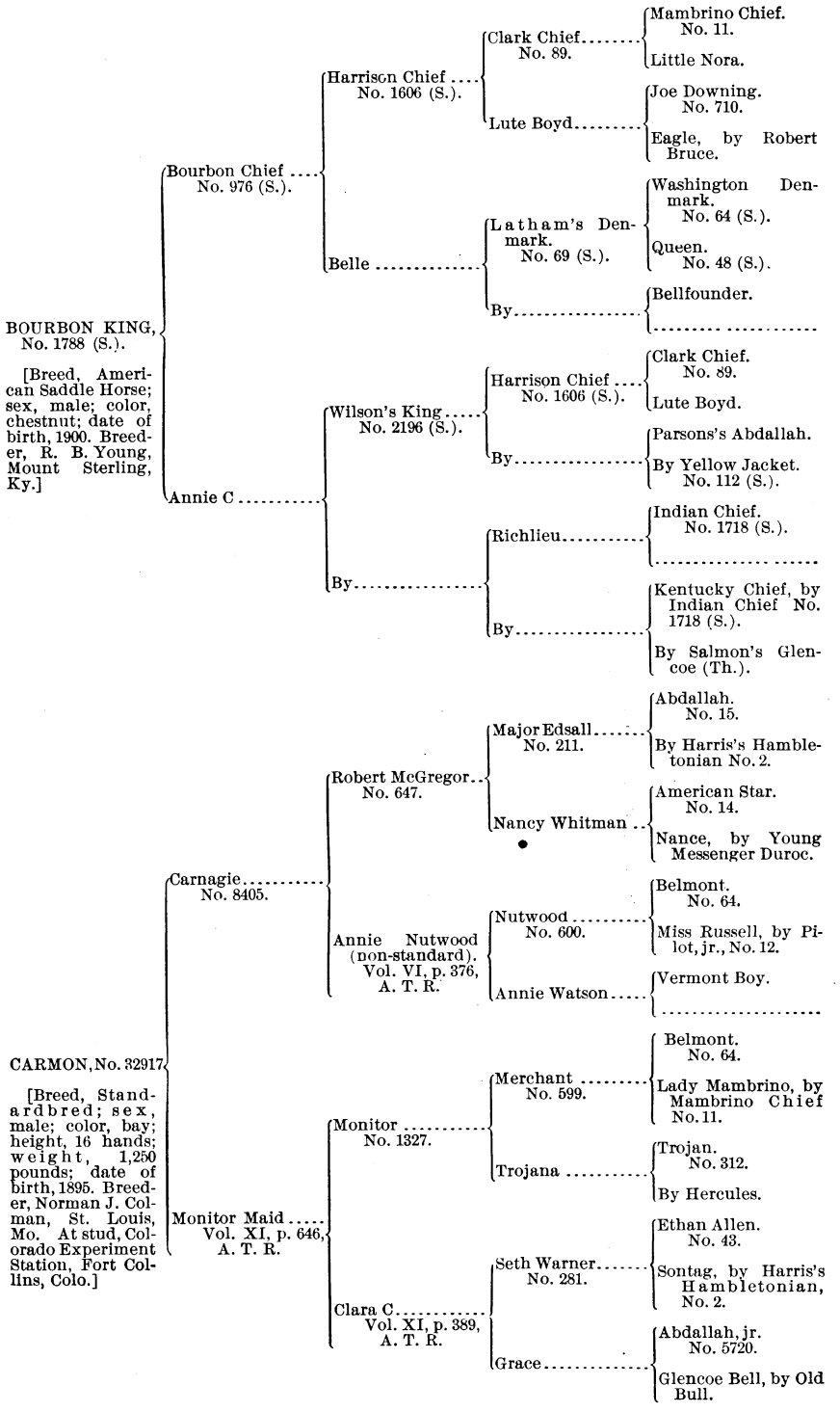
LIST OF PEDIGREES.

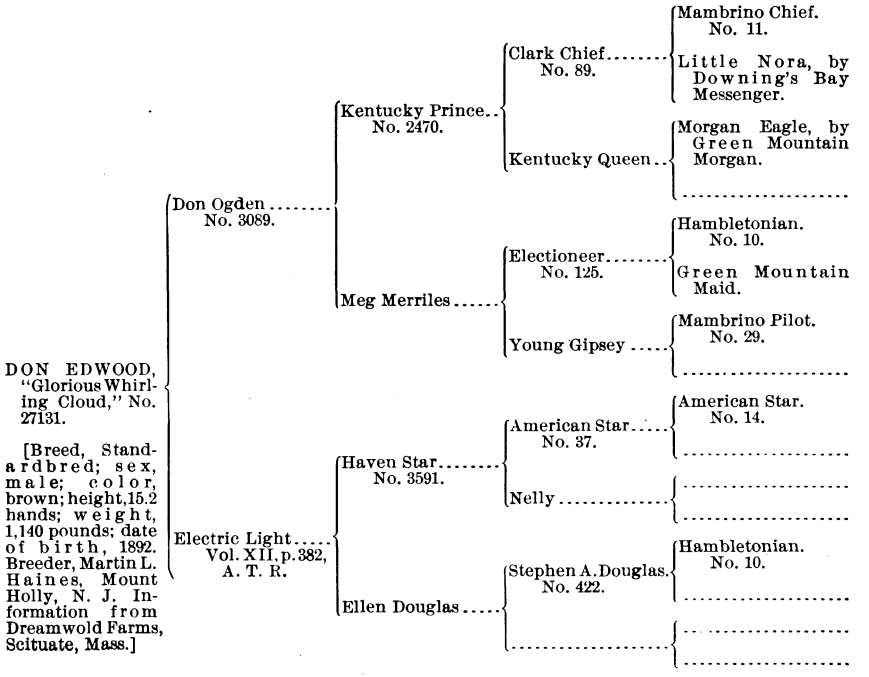
In the following pages are a number of tabulated pedigrees (in alphabetical order) of horses in the Department's studs, as well as of a number of show horses and of others referred to in the foregoing pages as important sires. In every case where a horse is not registered, or where it has been shown under a different name from that under which it was registered, a notation is made showing the authority for the pedigree as published. The plan of indicating the registry numbers is explained on page 107 (footnote).

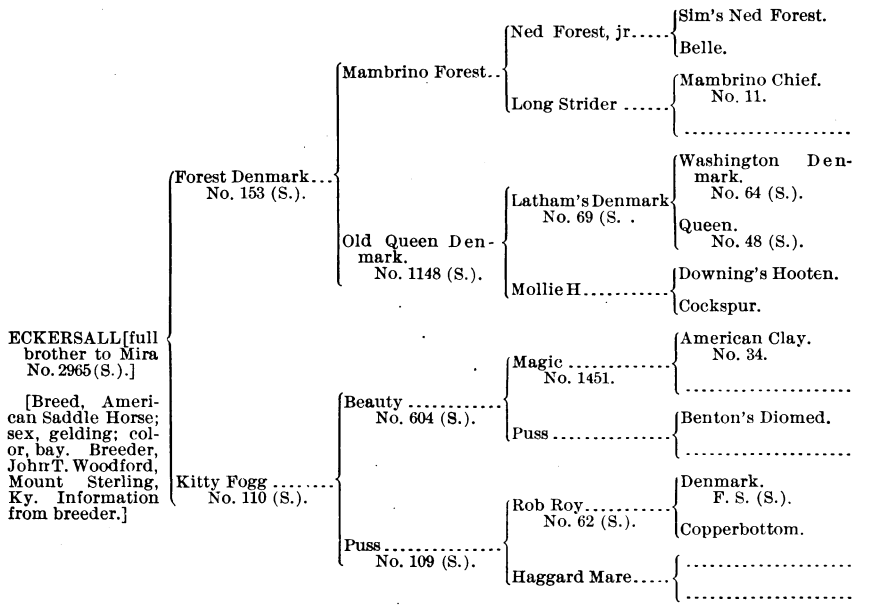


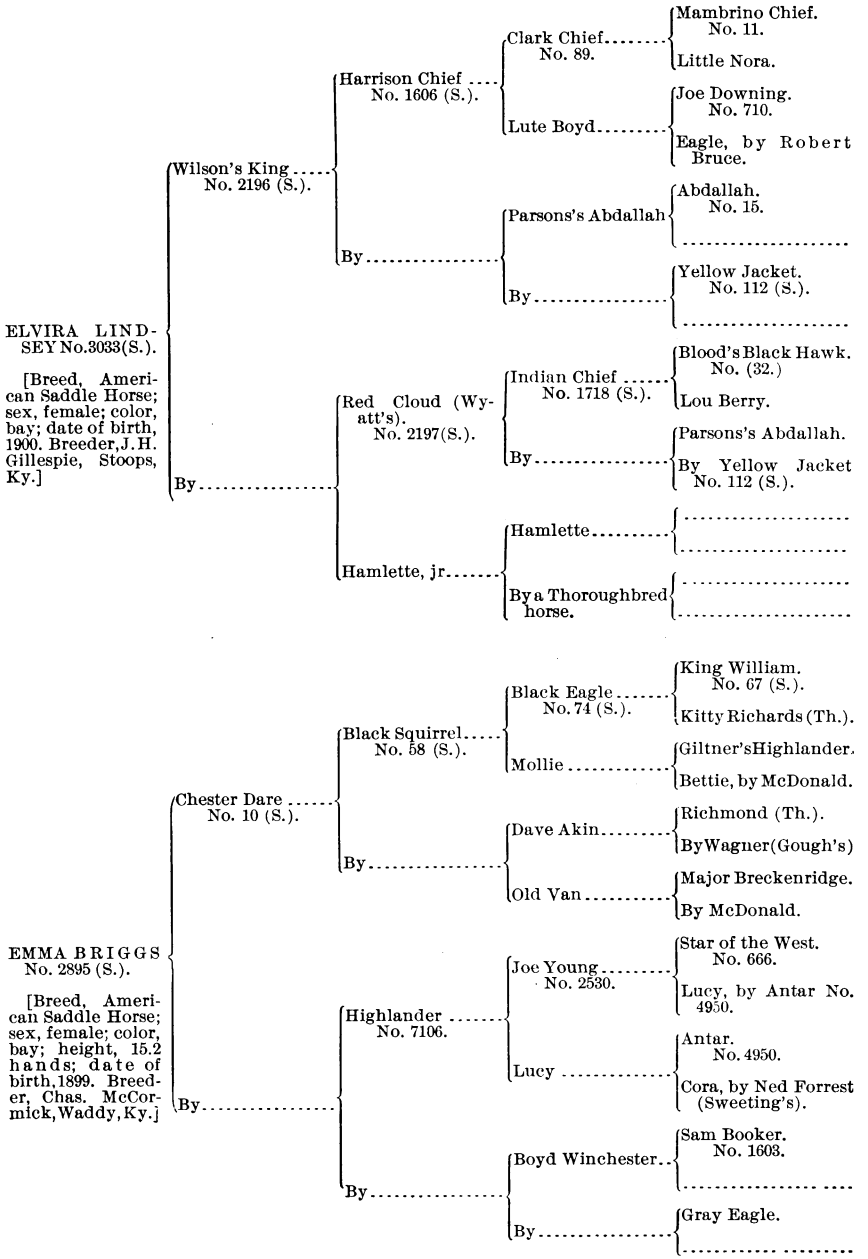

ARIZONA
[Sex, female; color, bay; height, 15.3½ hands; weight, 1,065 pounds; date of birth, 1899. Breeder, George D. Rainsford, Diamond, Wyo. In stud, Colorado Experiment Station, Fort Collins, Colo.]
Emigrant
Hoyden
Lord Winbeam
Lady Spartan
Red Bud (Th.)
Cora
George Peabody
By
Spartan
Lady Hattie
Tom Bowling
Oleander (Mary Hennessy).
Spartan, jr
Lady Fauna (An imported Yorkshire coach mare.)
Hambletonian. No. 10.
By Imp. Bellfounder.
Imp. Bellfounder.
Ethan Allen. No. 43.
Nelson.
Lady Fiddler.
Lexington.
Lucy Fowler, by Albion.
Tipperary.
Olio, by Oliver.
Spartan.
Lady Hattie.
BARTHENIA McCORD, No. 3223 (S.).
[Breed, American Saddle Horse; sex, female; color, bay; date of birth, 1894. In stud, Colorado Experiment Station, Fort Collins, Colo.]
Chester Dare No. 10 (S.).
By
Black Squirrel No. 58 (S.).
Peavine No. 85 (S.).
By
Black Eagle No. 74 (S.).
Mollie
Dave Akin
Old Van
Rattler No. 501.
Trojan
By
King William. No. 67 (S.).
Kitty Richards (Th.)
Giltner's Highlander
Bettie, by McDonald.
Richmond (Th.).
By Wagner (Gough's)
Major Breckenridge.
By McDonald.
Stockbridge Chief. No. (102).
Brinker's Drennon. No. 1600 (S.).
By Kavanaugh's Gray Eagle 87 (S,).

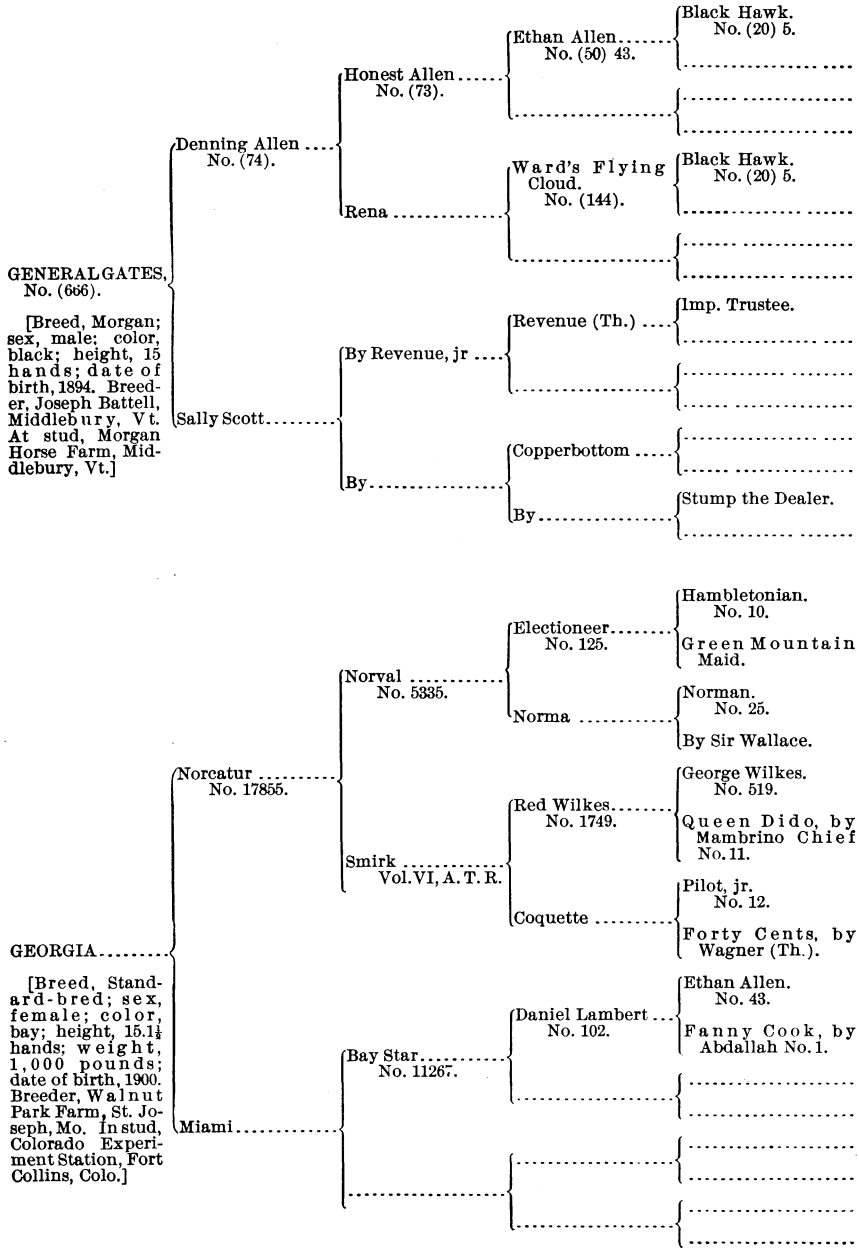

BEATRICE, No. 2079 (S.).
[Breed, American Saddle Horse; sex, female; color, bay; date of birth, 1901. Breeders, Gay Brothers, Pisgah, Ky. In stud, Colorado Experiment Station, Fort Collins, Colo.]
Highland Denmark. No. 730 (S.).
Lady Adams No. 2074 (S.).
Black Squirrel No. 58 (S.).
Miss Graves
Harrison Chief No. 1606 (S.).
By
Black Eagle No. 74 (S.).
Molly
Dave Akin No. 775 (S.).
By
Clark Chief No. 89.
Lute Boyd
Indian Chief No. 1718.
By
King William. No. 67.
Kitty Richards (Th.).
Giltner's Highlander.
Bettie, by McDonald.
Richmond, by Bolivar (Th.).
By Wagner (Gough's).
Blackburn's Whip.
A Thoroughbred mare.
Mambrino Chief. No. 11.
Little Nora.
Joe Downing. No. 710.
Eagle, by Robert Bruce.
Blood's Black Hawk. No. (32).
Lou Berry.
BETHEL PRINCESS, No. 4796 (S.).
[Breed, American Saddle Horse; sex, female; color, chestnut; date of birth, 1902. Breeder, Mose Hendricks, Bath County, Ky. In stud, Colorado Experiment Station, Fort Collins, Colo.]
Wilson's King No. 2196 (S.).
By
Harrison Chief No. 1606 (S.).
Belle
Sim's Clark Chief No. 2575 (S.).
By
Clark Chief No. 89.
Lute Boyd
Parsons's Abdallah
By
Clark Chief No. 89.
Virgie
Kentucky Chief
By
Mambrino Chief. No. 11.
Little Nora.
Joe Downing. No. 710.
Eagle, by Robert Bruce.
Abdallah. No. 15.
Yellow Jacket. No. 112 (S.).
Mambrino Chief. No. 11.
Little Nora.
Abdallah. No. 15.
By Veach's Abdallah.
Indian Chief. No. 1718 (S.).
War Dance.

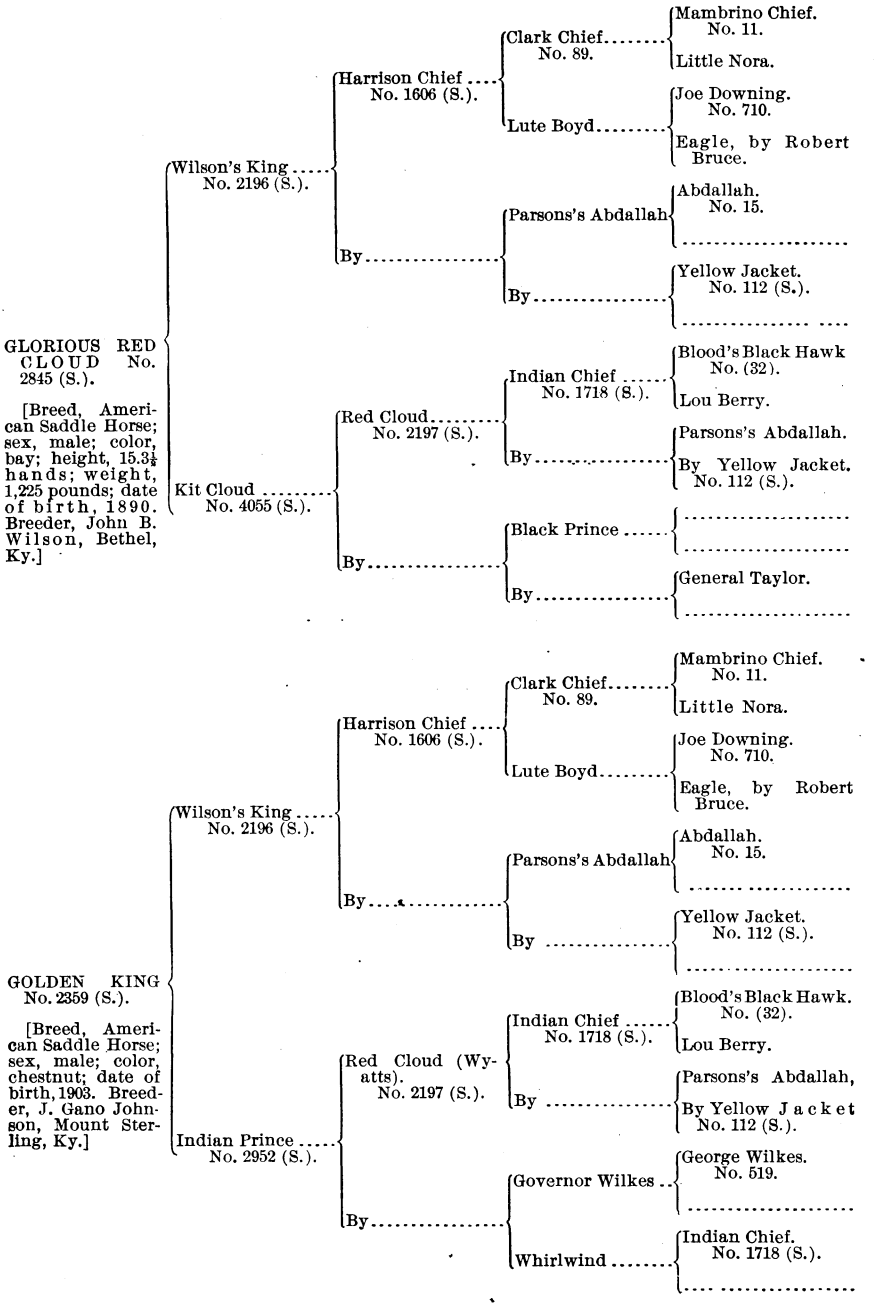

BOURBON KING, No. 1788 (S.).
[Breed, American Saddle Horse; sex, male; color, chestnut; date of birth, 1900. Breeder, R. B. Young, Mount Sterling, Ky.]
Bourbon Chief No. 976 (S.).
Annie C
Harrison Chief No. 1606 (S.).
Belle
Wilson's King No. 2196 (S.).
By
Clark Chief No. 89.
Lute Boyd
Latham's Denmark. No. 69 (S.).
By
Harrison Chief No. 1606 (S.).
By
Richlieu
By
Mambrino Chief. No. 11.
Little Nora.
Joe Downing. No. 710.
Eagle, by Robert Bruce.
Washington Denmark. No. 64 (S.).
Queen. No. 48 (S.).
Bellfounder.
Clark Chief. No. 89.
Lute Boyd.
Parsons's Abdallah.
By Yellow Jacket. No. 112 (S.).
Indian Chief. No. 1718 (S.).
Kentucky Chief, by Indian Chief No. 1718 (S.).
By Salmon's Glencoe (Th.).
CARMON, No. 32917
[Breed, Standardbred; sex, male; color, bay; height, 16 hands; weight, 1,250 pounds; date of birth, 1895. Breeder, Norman J. Colman, St. Louis, Mo. At stud, Colorado Experiment Station, Fort Collins, Colo.]
Carnagie No. 8405.
Monitor Maid Vol. XI, p. 646, A. T. R.
Robert McGregor No. 647.
Annie Nutwood (non-standard). Vol. VI, p. 376, A. T. R.
Monitor No. 1327.
Clara C Vol. XI, p. 389, A. T. R.
Major Edsall No. 211.
Nancy Whitman
Nutwood No. 600.
Annie Watson
Merchant No. 599.
Trojana
Seth Warner No. 281.
Grace
Abdallah. No. 15.
By Harris's Hambletonian No. 2.
American Star. No. 14.
Nance, by Young Messenger Duroc.
Belmont. No. 64.
Miss Russell, by Pilot, jr., No. 12.
Vermont Boy.
Belmont. No. 64.
Lady Mambrino, by Mambrino Chief No. 11.
Trojan. No. 312.
By Hercules.
Ethan Allen. No. 43.
Sontag, by Harris's Hambletonian, No. 2.
Abdallah, jr. No. 5720.
Glencoe Bell, by Old Bull.

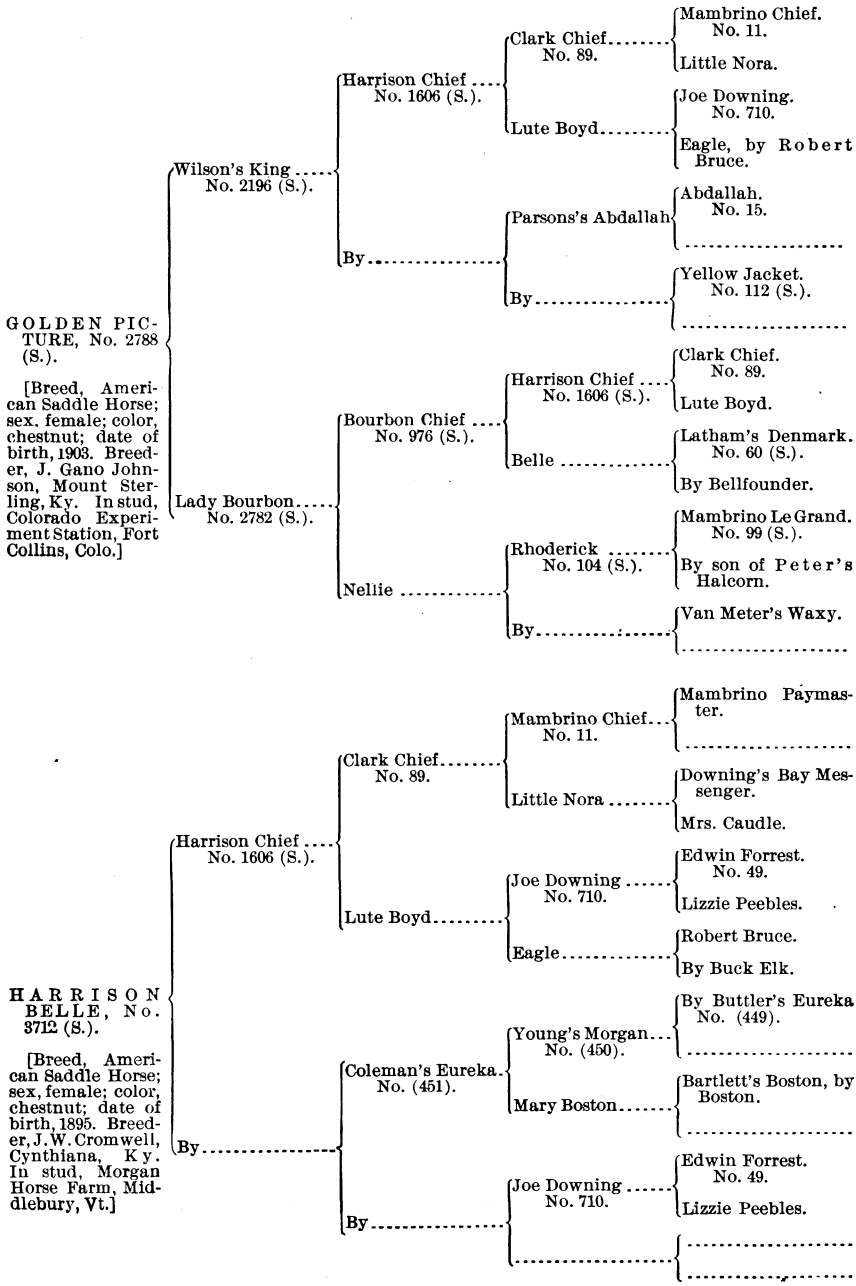

DON EDWOOD, "Glorious Whirling Cloud," No. 27131.
[Breed, Standardbred; sex, male; color, brown; height, 15.2 hands; weight, 1,140 pounds; date of birth, 1892. Breeder, Martin L. Haines, Mount Holly, N. J. Information from Dreamwold Farms, Scituate, Mass.]
Don Ogden No. 3089.
Electric Light Vol. XII, p. 382, A. T. R.
Kentucky Prince No. 2470.
Meg Merriles
Haven Star No. 3591.
Ellen Douglas
Clark Chief No. 89.
Kentucky Queen
Electioneer No. 125.
Young Gipsey
American Star No. 37.
Nelly
Stephen A. Douglas No. 422.
Mambrino Chief No. 11.
Little Nora, by Downing's Bay Messenger.
Morgan Eagle, by Green Mountain Morgan.
Hambletonian No. 10.
Green Mountain Maid.
Mambrino Pilot No. 29.
American Star No. 14.
Hambletonian No. 10.

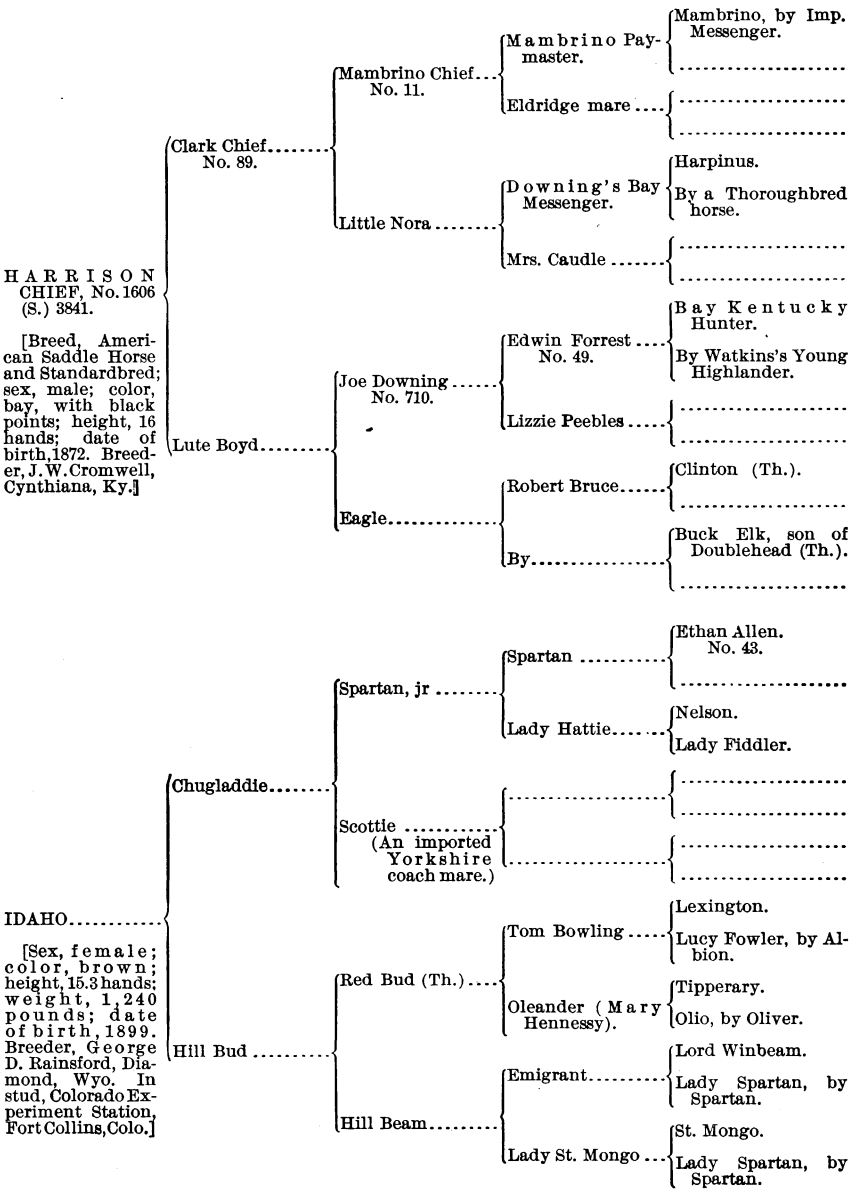

ECKERSALL [full brother to Mira No. 2965 (S.).]
[Breed, American Saddle Horse; sex, gelding; color, bay. Breeder, John T. Woodford, Mount Sterling, Ky. Information from breeder.]
Forest Denmark No. 153 (S.).
Kitty Fogg No. 110 (S.).
Mambrino Forest
Old Queen Denmark No. 1148 (S.).
Beauty No. 604 (S.).
Puss No. 109 (S.).
Ned Forest, jr.
Long Strider
Latham's Denmark No. 69 (S.
Mollie H
Magic No. 1451.
Puss
Rob Roy No. 62 (S.).
Haggard Mare
Sim's Ned Forest.
Belle.
Mambrino Chief No. 11.
Washington Denmark No. 64 (S.).
Queen No. 48 (S.).
Downing's Hooten.
Cockspur.
American Clay No. 34.
Benton's Diomed.
Denmark F. S. (S.).
Copperbottom.

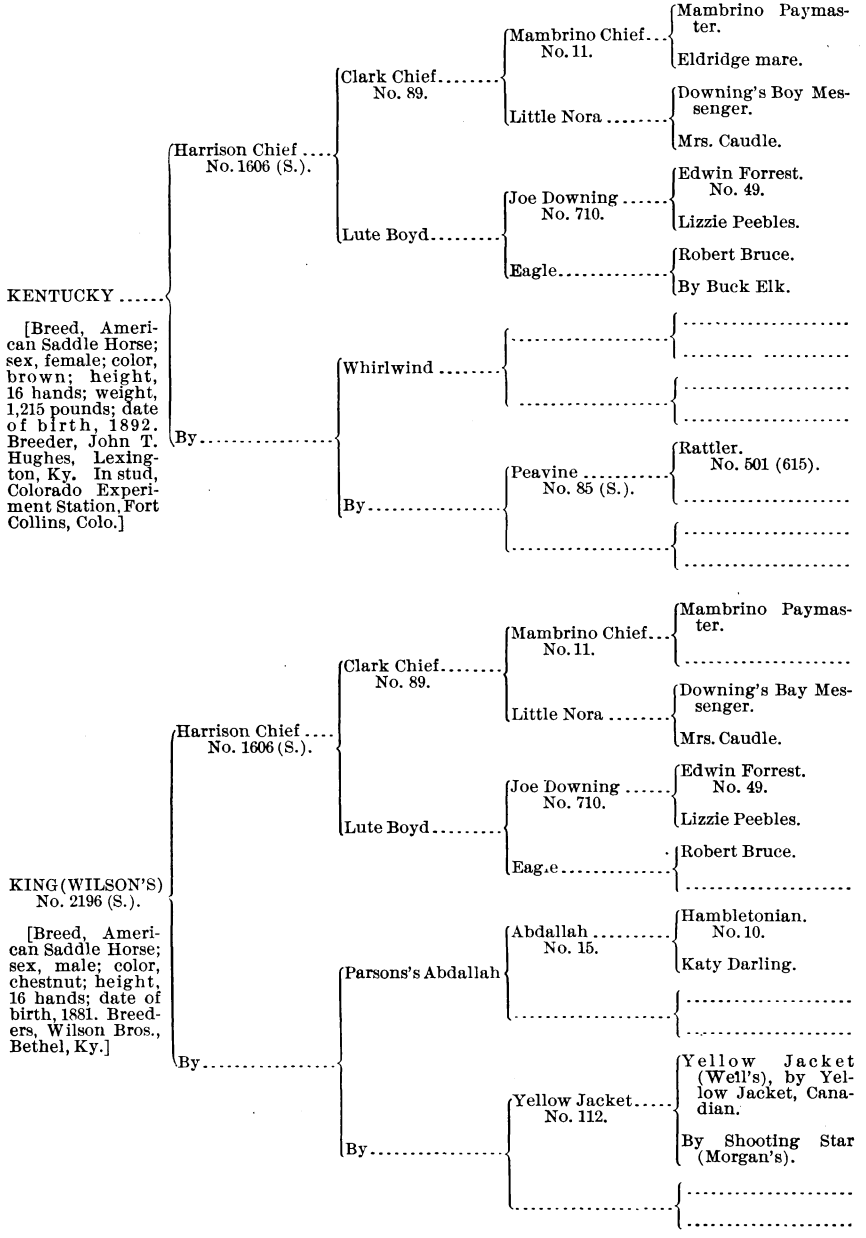

ELVIRA LINDSEY No. 3033 (S.).
[Breed, American Saddle Horse; sex, female; color, bay; date of birth, 1900. Breeder, J. H. Gillespie, Stoops, Ky.]
Wilson's King No. 2196 (S.).
By
Harrison Chief No. 1606 (S.).
By
Red Cloud (Wyatt's). No. 2197 (S.).
Hamlette, jr.
Clark Chief No. 89.
Lute Boyd
Parsons's Abdallah
By
Indian Chief No. 1718 (S.).
By
Hamlette
By a Thoroughbred horse.
Mambrino Chief. No. 11.
Little Nora.
Joe Downing. No. 710.
Eagle, by Robert Bruce.
Abdallah. No. 15.
Yellow Jacket. No. 112 (S.).
Blood's Black Hawk. No. (32.)
Lou Berry.
Parsons's Abdallah.
By Yellow Jacket No. 112 (S.).
EMMA BRIGGS No. 2895 (S.).
[Breed, American Saddle Horse; sex, female; color, bay; height, 15.2 hands; date of birth, 1899. Breeder, Chas. McCormick, Waddy, Ky.]
Chester Dare No. 10 (S.).
By
Black Squirrel No. 58 (S.).
By
Highlander No. 7106.
By
Black Eagle No. 74 (S.).
Mollie
Dave Akin
Old Van
Joe Young No. 2530.
Lucy
Boyd Winchester
By
King William. No. 67 (S.).
Kitty Richards (Th.).
Giltner's Highlander.
Bettie, by McDonald.
Richmond (Th.).
By Wagner (Gough's)
Major Breckenridge.
By McDonald.
Star of the West. No. 666.
Lucy, by Antar No. 4950.
Antar. No. 4950.
Cora, by Ned Forrest (Sweeting's).
Sam Booker. No. 1603.
Gray Eagle.

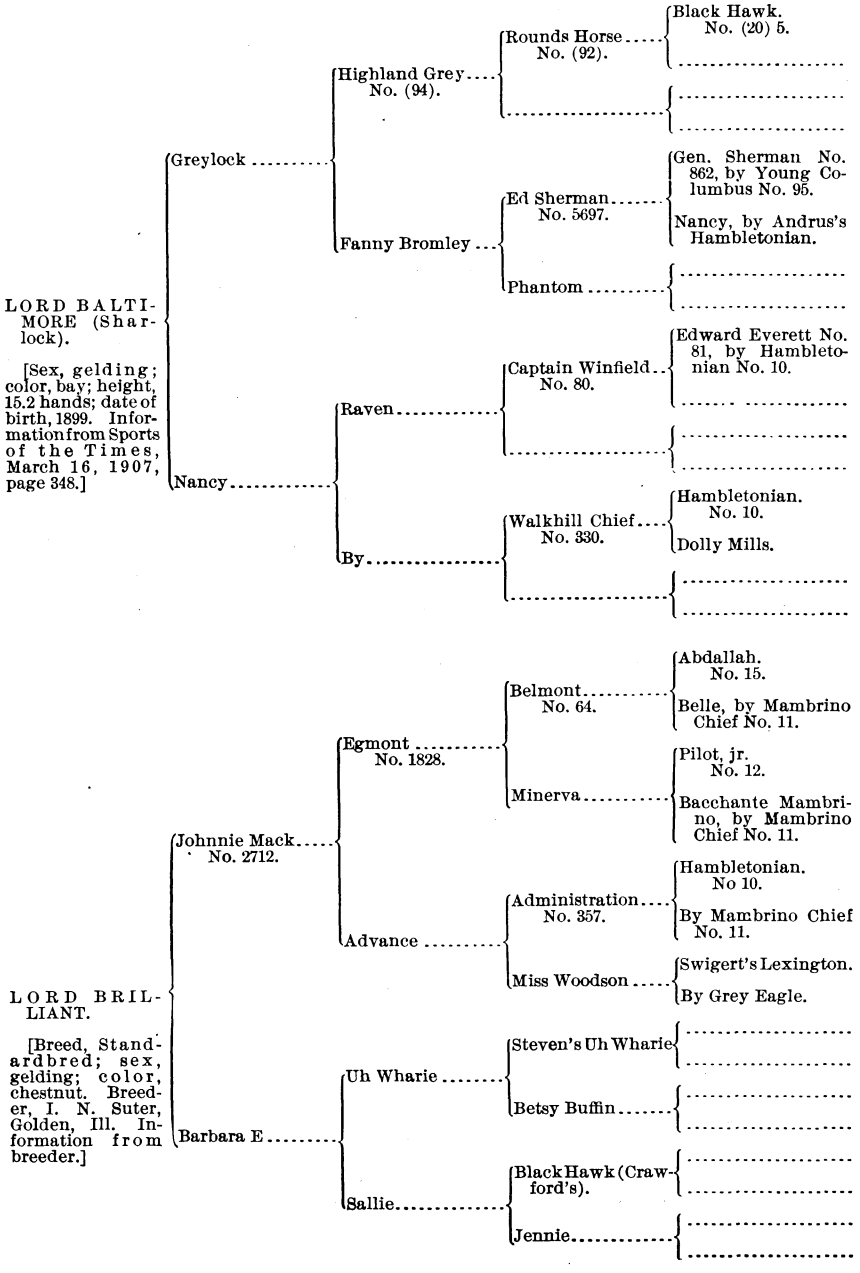

GENERAL GATES, No. (666).
[Breed, Morgan; sex, male; color, black; height, 15 hands; date of birth, 1894. Breeder, Joseph Battell, Middlebury, Vt. At stud, Morgan Horse Farm, Middlebury, Vt.]
Denning Allen No. (74).
Sally Scott
Honest Allen No. (73).
Rena
By Revenue, jr
By
Ethan Allen No. (50) 43.
Ward's Flying Cloud. No. (144).
Revenue (Th.)
Copperbottom
By
Black Hawk. No. (20) 5.
Black Hawk. No. (20) 5.
Imp. Trustee.
Stump the Dealer.
GEORGIA
[Breed, Standard-bred; sex, female; color, bay; height, 15.1½ hands; weight, 1,000 pounds; date of birth, 1900. Breeder, Walnut Park Farm, St. Joseph, Mo. In stud, Colorado Experiment Station, Fort Collins, Colo.]
Norcatur No. 17855.
Miami
Norval No. 5335.
Smirk Vol. VI, A. T. R.
Bay Star No. 11267.
Electioneer No. 125.
Norma
Red Wilkes No. 1749.
Coquette
Daniel Lambert No. 102.
Hambletonian. No. 10.
Green Mountain Maid.
Norman. No. 25.
By Sir Wallace.
George Wilkes. No. 519.
Queen Dido, by Mambrino Chief No. 11.
Pilot, jr. No. 12.
Forty Cents, by Wagner (Th.).
Ethan Allen. No. 43.
Fanny Cook, by Abdallah No. 1.

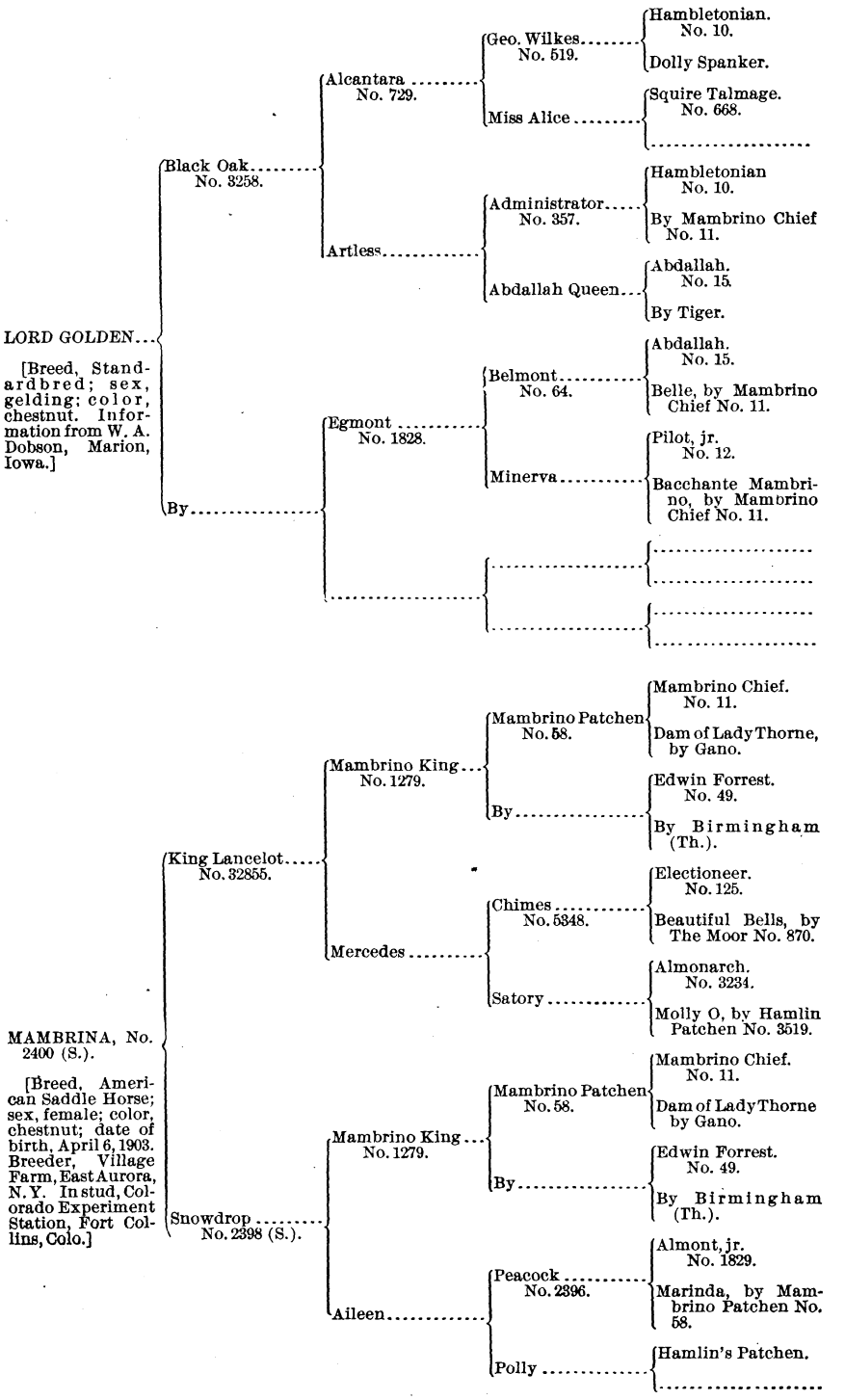

GLORIOUS RED CLOUD No. 2845 (S.).
[Breed, American Saddle Horse; sex, male; color, bay; height, 15.3½ hands; weight, 1,225 pounds; date of birth, 1890. Breeder, John B. Wilson, Bethel, Ky.]
Wilson's King No. 2196 (S.).
Kit Cloud No. 4055 (S.).
Harrison Chief No. 1606 (S.).
By
Red Cloud No. 2197 (S.).
By
Clark Chief No. 89.
Lute Boyd
Parsons's Abdallah
By
Indian Chief No. 1718 (S.).
By
Black Prince
By
Mambrino Chief. No. 11.
Little Nora.
Joe Downing. No. 710.
Eagle, by Robert Bruce.
Abdallah. No. 15.
Yellow Jacket. No. 112 (S.).
Blood's Black Hawk No. (32).
Lou Berry.
Parsons's Abdallah.
By Yellow Jacket. No. 112 (S.).
General Taylor.
GOLDEN KING No. 2359 (S.).
[Breed, American Saddle Horse; sex, male; color, chestnut; date of birth, 1903. Breeder, J. Gano Johnson, Mount Sterling, Ky.]
Wilson's King No. 2196 (S.).
Indian Prince No. 2952 (S.).
Harrison Chief No. 1606 (S.).
By
Red Cloud (Wyatts). No. 2197 (S.).
By
Clark Chief No. 89.
Lute Boyd
Parsons's Abdallah
By
Indian Chief No. 1718 (S.).
By
Governor Wilkes
Whirlwind
Mambrino Chief. No. 11.
Little Nora.
Joe Downing. No. 710.
Eagle, by Robert Bruce.
Abdallah. No. 15.
Yellow Jacket. No. 112 (S.).
Blood's Black Hawk. No. (32).
Lou Berry.
Parsons's Abdallah,
By Yellow Jacket No. 112 (S.).
George Wilkes. No. 519.
Indian Chief. No. 1718 (S.).

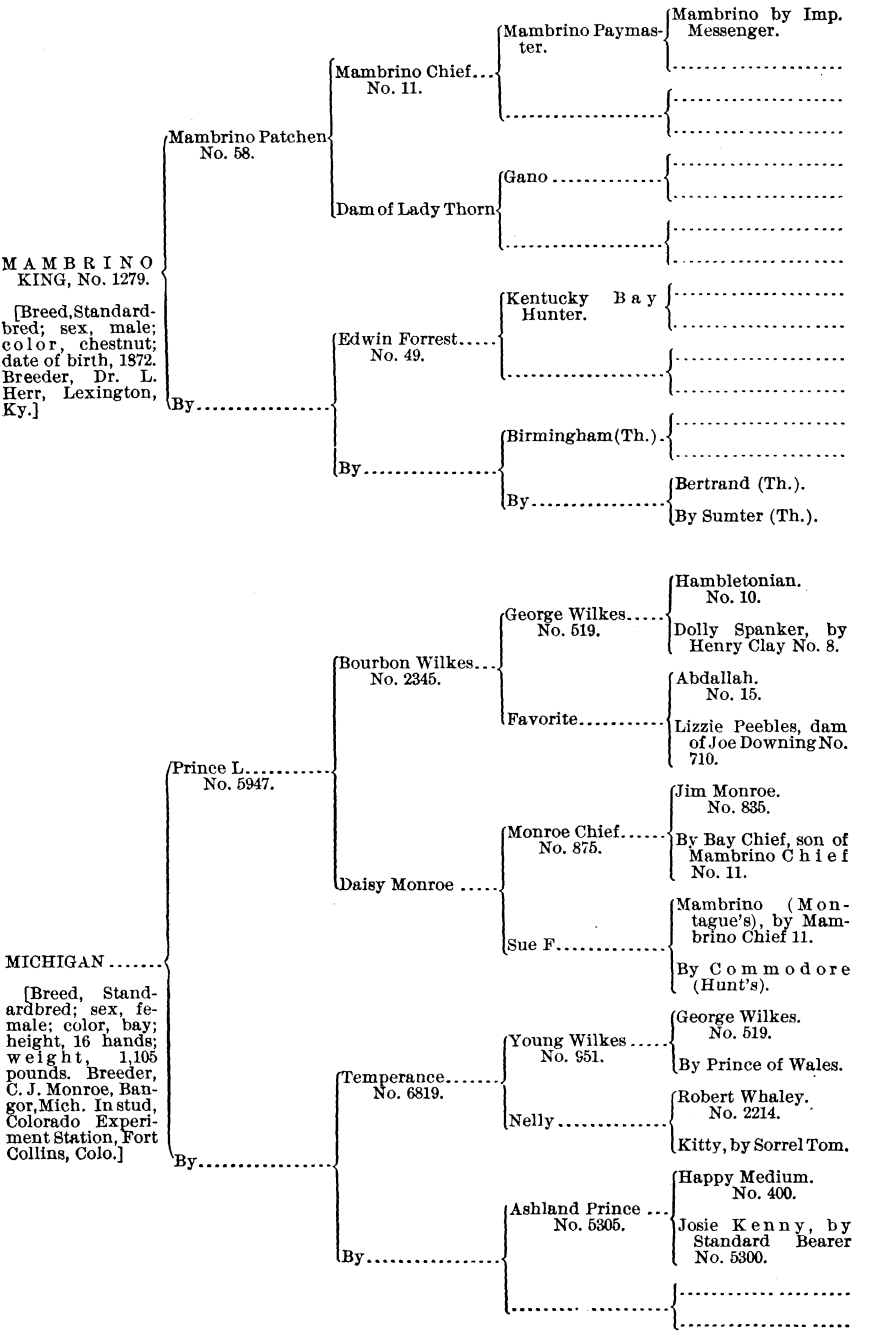

GOLDEN PICTURE, No. 2788 (S.).
[Breed, American Saddle Horse; sex, female; color, chestnut; date of birth, 1903. Breeder, J. Gano Johnson, Mount Sterling, Ky. In stud, Colorado Experiment Station, Fort Collins, Colo.]
Wilson's King No. 2196 (S.).
Lady Bourbon No. 2782 (S.).
Harrison Chief No. 1606 (S.).
By
Bourbon Chief No. 976 (S.).
Nellie
Clark Chief No. 89.
Lute Boyd
Parsons's Abdallah
By
Harrison Chief No. 1606 (S.).
Belle
Rhoderick No. 104 (S.).
By
Mambrino Chief. No. 11.
Little Nora.
Joe Downing. No. 710.
Eagle, by Robert Bruce.
Abdallah. No. 15.
Yellow Jacket. No. 112 (S.).
Clark Chief. No. 89.
Lute Boyd.
Latham's Denmark. No. 60 (S.).
By Bellfounder.
Mambrino LeGrand. No. 99 (S.).
By son of Peter's Halcorn.
Van Meter's Waxy.
HARRISON BELLE, No. 3712 (S.).
[Breed, American Saddle Horse; sex, female; color, chestnut; date of birth, 1895. Breeder, J. W. Cromwell, Cynthiana, Ky. In stud, Morgan Horse Farm, Middlebury, Vt.]
Harrison Chief No. 1606 (S.).
By
Clark Chief No. 89.
Lute Boyd
Coleman's Eureka No. (451).
By
Mambrino Chief No. 11.
Little Nora
Joe Downing No. 710.
Eagle
Young's Morgan No. (450).
Mary Boston
Joe Downing No. 710.
Mambrino Paymaster.
Downing's Bay Messenger.
Mrs. Caudle.
Edwin Forrest. No. 49.
Lizzie Peebles.
Robert Bruce.
By Buck Elk.
By Buttler's Eureka No. (449).
Bartlett's Boston, by Boston.
Edwin Forrest. No. 49.
Lizzie Peebles.

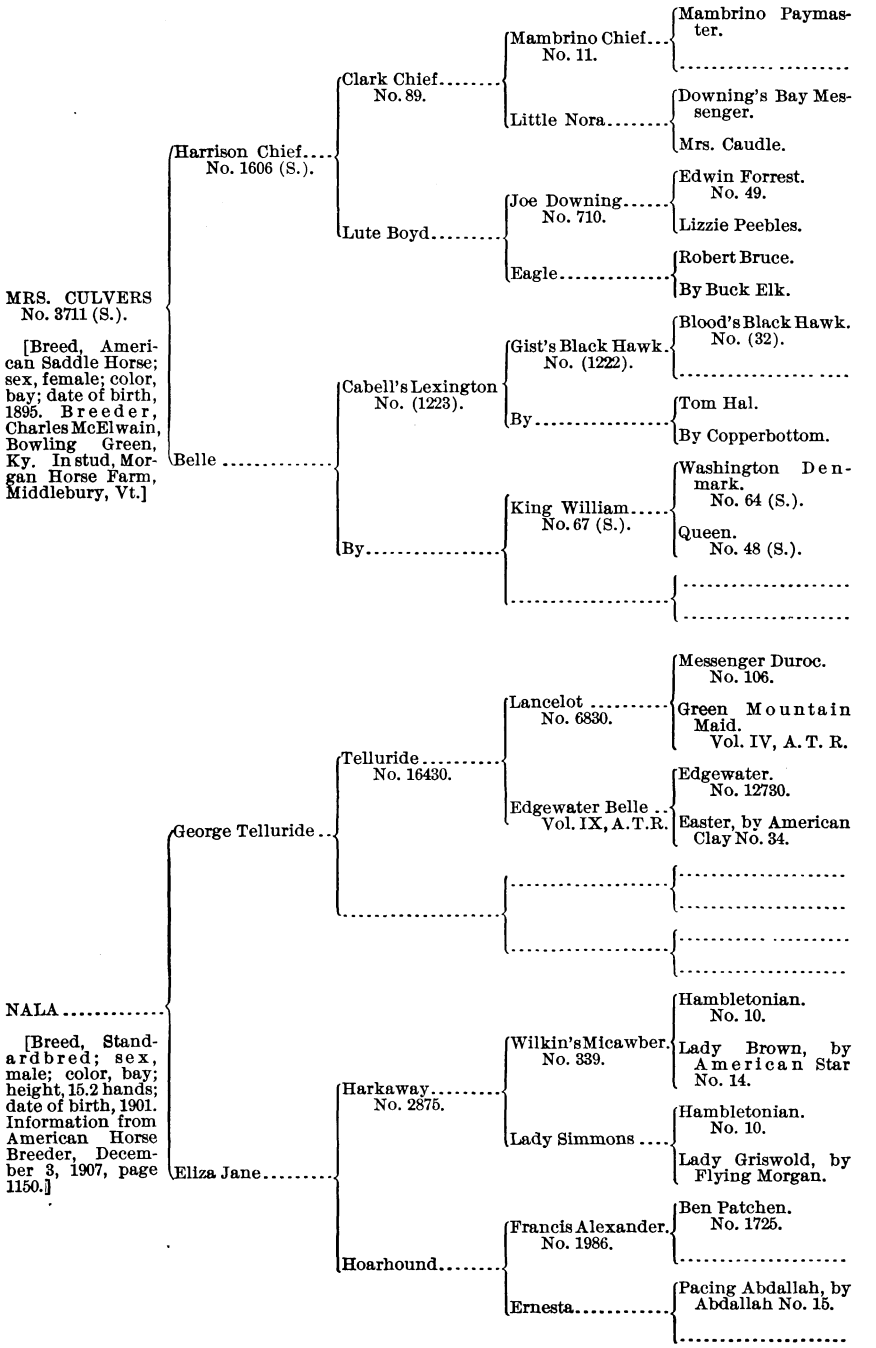

HARRISON CHIEF, No. 1606 (S.) 3841.
[Breed, American Saddle Horse and Standardbred; sex, male; color, bay, with black points; height, 16 hands; date of birth, 1872. Breeder, J. W. Cromwell, Cynthiana, Ky.]
Clark Chief No. 89.
Lute Boyd
Mambrino Chief No. 11.
Little Nora
Joe Downing No. 710.
Eagle
Mambrino Paymaster.
Eldridge mare
Downing's Bay Messenger.
Mrs. Caudle
Edwin Forrest No. 49.
Lizzie Peebles
Robert Bruce
By
Mambrino, by Imp. Messenger.
Harpinus.
By a Thoroughbred horse.
Bay Kentucky Hunter.
By Watkins's Young Highlander.
Clinton (Th.).
Buck Elk, son of Doublehead (Th.).
IDAHO
[Sex, female; color, brown; height, 15.3 hands; weight, 1,240 pounds; date of birth, 1899. Breeder, George D. Rainsford, Diamond, Wyo. In stud, Colorado Experiment Station, Fort Collins, Colo.]
Chugladdie
Hill Bud
Spartan, jr
Scottie (An imported Yorkshire coach mare.)
Red Bud (Th.)
Hill Beam
Spartan
Lady Hattie
Tom Bowling
Oleander (Mary Hennessy).
Emigrant
Lady St. Mongo
Ethan Allen. No. 43.
Nelson.
Lady Fiddler.
Lexington.
Lucy Fowler, by Albion.
Tipperary.
Olio, by Oliver.
Lord Winbeam.
Lady Spartan, by Spartan.
St. Mongo.
Lady Spartan, by Spartan.

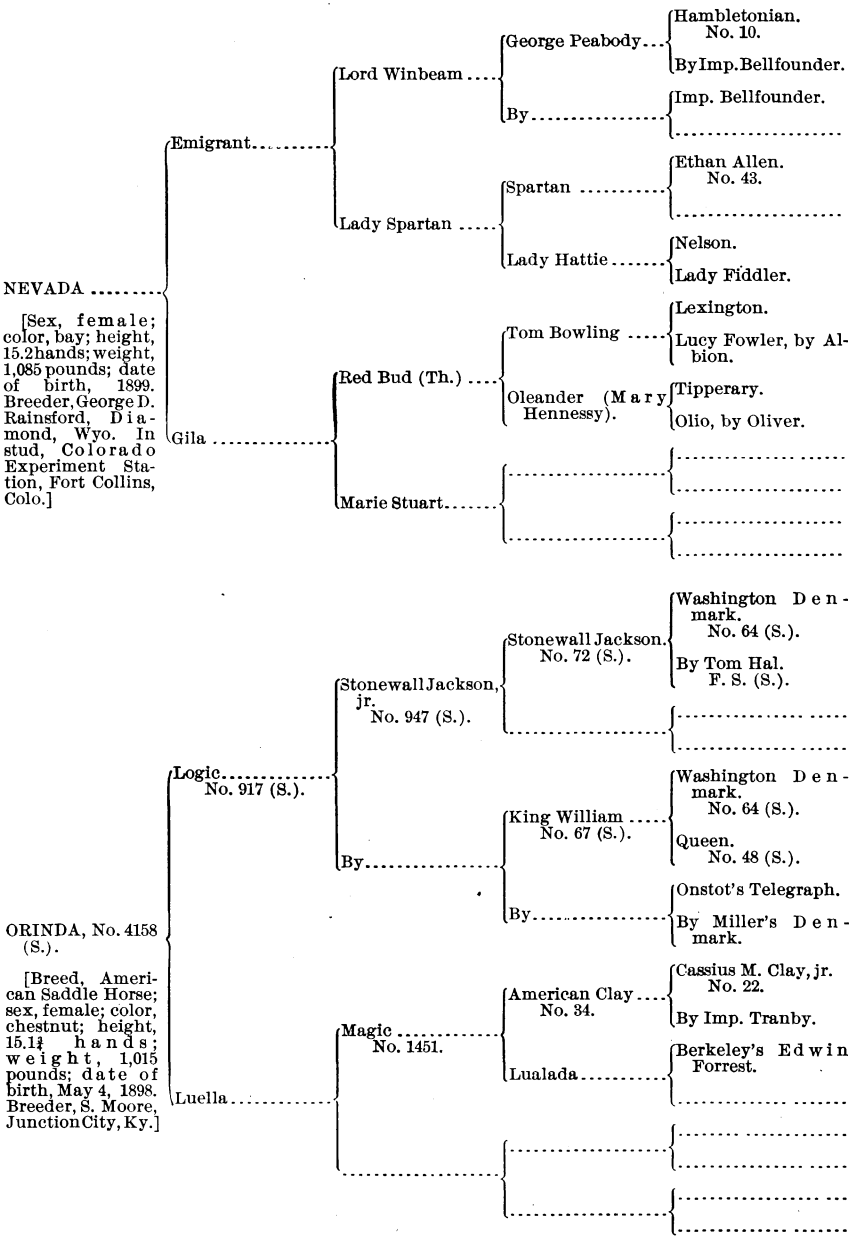

KENTUCKY
[Breed, American Saddle Horse; sex, female; color, brown; height, 16 hands; weight, 1,215 pounds; date of birth, 1892. Breeder, John T. Hughes, Lexington, Ky. In stud, Colorado Experiment Station, Fort Collins, Colo.]
Harrison Chief No. 1606 (S.).
By
Clark Chief No. 89.
Lute Boyd
Whirlwind
By
Mambrino Chief No. 11.
Little Nora
Joe Downing No. 710.
Eagle
Peavine No. 85 (S.).
Mambrino Paymaster.
Eldridge mare.
Downing's Boy Messenger.
Mrs. Caudle.
Edwin Forrest. No. 49.
Lizzie Peebles.
Robert Bruce.
By Buck Elk.
Rattler. No. 501 (615).
KING (WILSON'S) No. 2196 (S.).
[Breed, American Saddle Horse; sex, male; color, chestnut; height, 16 hands; date of birth, 1881. Breeders, Wilson Bros., Bethel, Ky.]
Harrison Chief No. 1606 (S.).
By
Clark Chief No. 89.
Lute Boyd
Parsons's Abdallah
By
Mambrino Chief No. 11.
Little Nora
Joe Downing No. 710.
Eagle
Abdallah No. 15.
Yellow Jacket No. 112.
Mambrino Paymaster.
Downing's Bay Messenger.
Mrs. Caudle.
Edwin Forrest. No. 49.
Lizzie Peebles.
Robert Bruce.
Hambletonian. No. 10.
Katy Darling.
Yellow Jacket (Well's), by Yellow Jacket, Canadian.
By Shooting Star (Morgan's).

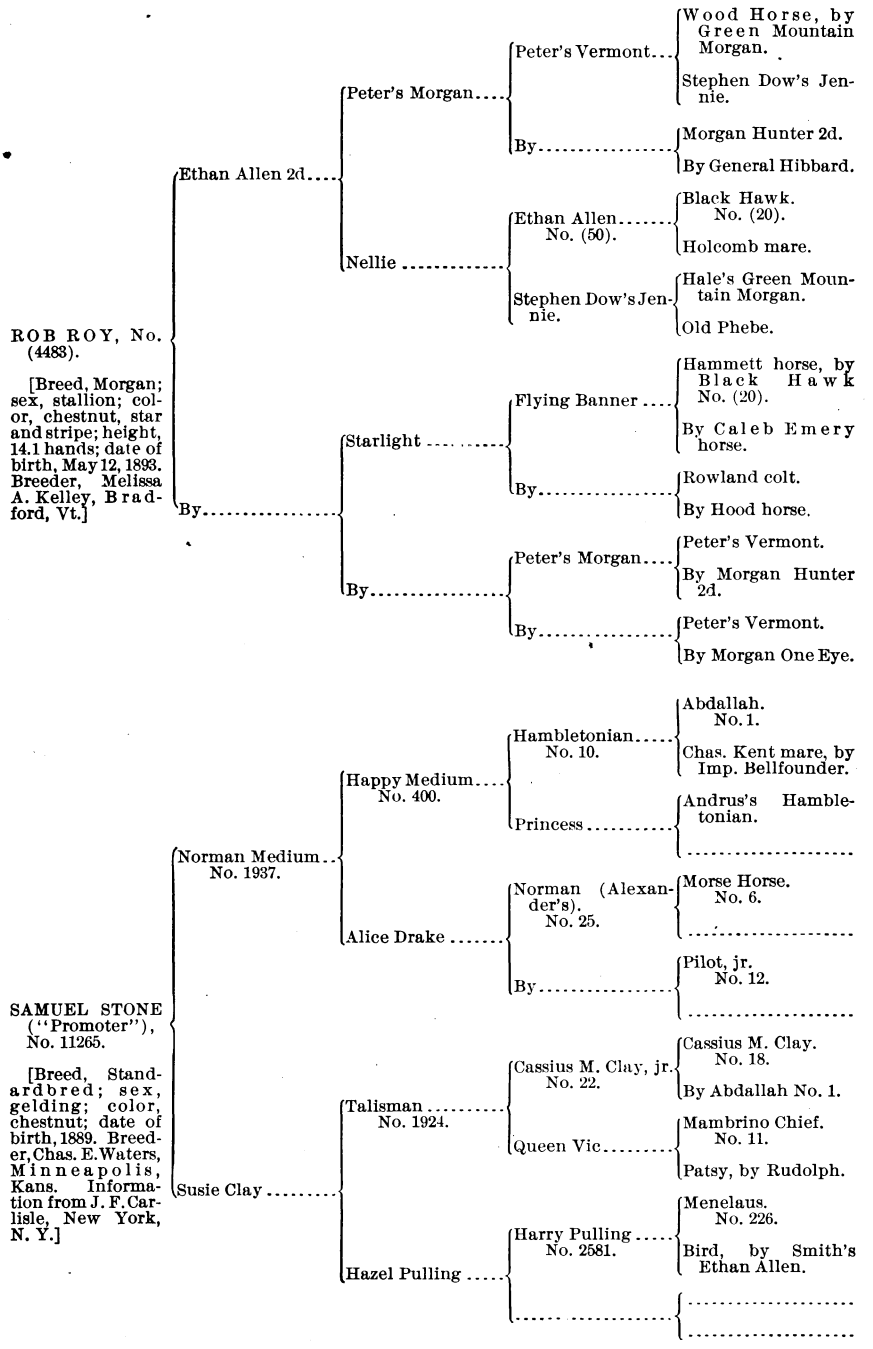

LORD BALTIMORE (Sharlock).
[Sex, gelding; color, bay; height, 15.2 hands; date of birth, 1899. Information from Sports of the Times, March 16, 1907, page 348.]
Greylock
Nancy
Highland Grey No. (94).
Fanny Bromley
Raven
By
Rounds Horse No. (92).
Ed Sherman No. 5697.
Captain Winfield No. 80.
Walkhill Chief No. 330.
Black Hawk. No. (20) 5.
Gen. Sherman No. 862, by Young Columbus No. 95.
Nancy, by Andrus's Hambletonian.
Edward Everett No. 81, by Hambletonian No. 10.
Hambletonian. No. 10.
Dolly Mills.
LORD BRILLIANT.
[Breed, Standardbred; sex, gelding; color, chestnut. Breeder, I. N. Suter, Golden, Ill. Information from breeder.]
Johnnie Mack No. 2712.
Barbara E
Egmont No. 1828.
Advance
Uh Wharie
Sallie
Belmont No. 64.
Minerva
Administration No. 357.
Miss Woodson
Steven's Uh Wharie
Betsy Buffin
Black Hawk (Crawford's).
Jennie
Abdallah. No. 15.
Belle, by Mambrino Chief No. 11.
Pilot, jr. No. 12.
Bacchante Mambrino, by Mambrino Chief No. 11.
Hambletonian. No 10.
By Mambrino Chief No. 11.
Swigert's Lexington.
By Grey Eagle.

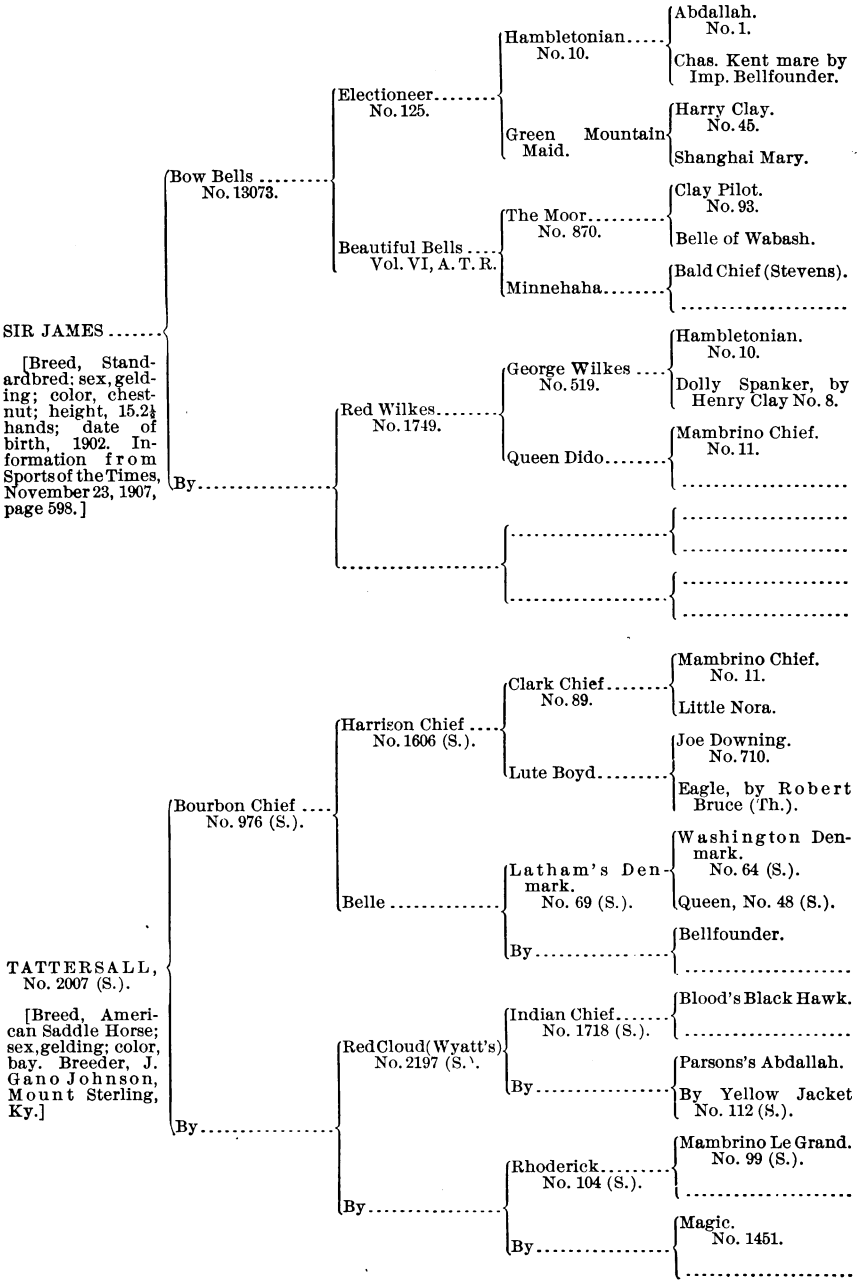

LORD GOLDEN...
[Breed, Standardbred; sex, gelding; color, chestnut. Information from W. A. Dobson, Marion, Iowa.]
Black Oak No. 3258.
By...
Alcantara No. 729.
Artless...
Egmont No. 1828.
Geo. Wilkes No. 519.
Miss Alice...
Administrator No. 357.
Abdallah Queen...
Belmont No. 64.
Minerva...
Hambletonian. No. 10.
Dolly Spanker.
Squire Talmage. No. 668.
Hambletonian No. 10.
By Mambrino Chief No. 11.
Abdallah. No. 15.
By Tiger.
Abdallah. No. 15.
Belle, by Mambrino Chief No. 11.
Pilot, jr. No. 12.
Bacchante Mambrino, by Mambrino Chief No. 11.
MAMBRINA, No. 2400 (S.).
[Breed, American Saddle Horse; sex, female; color, chestnut; date of birth, April 6, 1903. Breeder, Village Farm, East Aurora, N. Y. In stud, Colorado Experiment Station, Fort Collins, Colo.]
King Lancelot No. 32855.
Snowdrop No. 2398 (S.).
Mambrino King No. 1279.
Mercedes...
Mambrino King No. 1279.
Aileen...
Mambrino Patchen No. 58.
By...
Chimes No. 5348.
Satory...
Peacock No. 2396.
Polly...
Mambrino Chief. No. 11.
Dam of Lady Thorne, by Gano.
Edwin Forrest. No. 49.
By Birmingham (Th.).
Electioneer. No. 125.
Beautiful Bells, by The Moor No. 870.
Almonarch. No. 3234.
Molly O, by Hamlin Patchen No. 3519.
Almont, jr. No. 1829.
Marinda, by Mambrino Patchen No. 58.
Hamlin's Patchen.

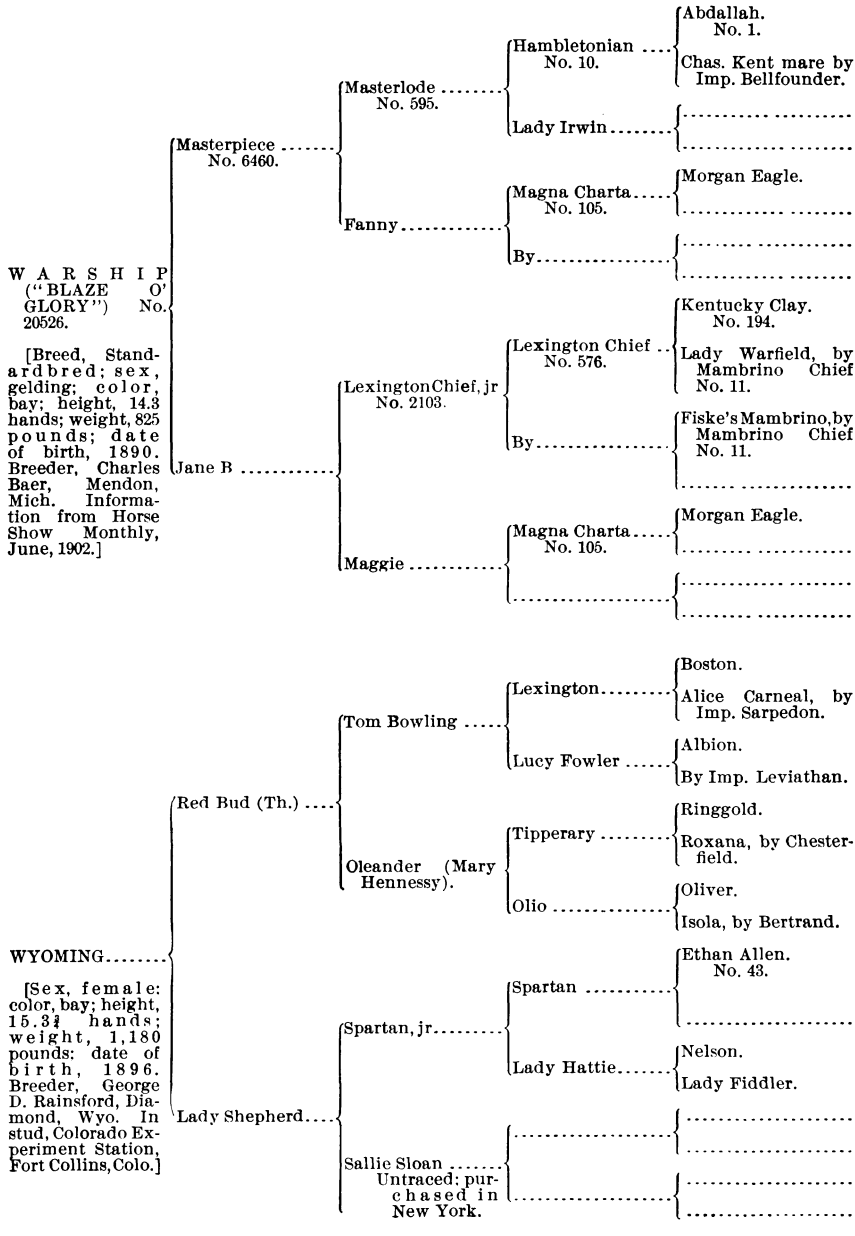

MAMBRINO KING, No. 1279.
[Breed, Standardbred; sex, male; color, chestnut; date of birth, 1872. Breeder, Dr. L. Herr, Lexington, Ky.]
Mambrino Patchen No. 58.
By
Mambrino Chief No. 11.
Dam of Lady Thorn
By
Mambrino Paymaster.
Gano
Edwin Forrest No. 49.
Kentucky Bay Hunter.
Birmingham (Th.).
By
Mambrino by Imp. Messenger.
Bertrand (Th.).
By Sumter (Th.).
MICHIGAN
[Breed, Standardbred; sex, female; color, bay; height, 16 hands; weight, 1,105 pounds. Breeder, C. J. Monroe, Bangor, Mich. In stud, Colorado Experiment Station, Fort Collins, Colo.]
Prince L. No. 5947.
By
Bourbon Wilkes No. 2345.
Daisy Monroe
Temperance No. 6819.
By
George Wilkes No. 519.
Favorite
Monroe Chief No. 875.
Sue F.
Young Wilkes No. 951.
Nelly
Ashland Prince No. 5305.
Hambletonian. No. 10.
Dolly Spanker, by Henry Clay No. 8.
Abdallah. No. 15.
Lizzie Peebles, dam of Joe Downing No. 710.
Jim Monroe. No. 835.
By Bay Chief, son of Mambrino Chief No. 11.
Mambrino (Montague's), by Mambrino Chief 11.
By Commodore (Hunt's).
George Wilkes. No. 519.
By Prince of Wales.
Robert Whaley. No. 2214.
Kitty, by Sorrel Tom.
Happy Medium. No. 400.
Josie Kenny, by Standard Bearer No. 5300.


MRS. CULVERS
No. 3711 (S.).
[Breed, American Saddle Horse; sex, female; color, bay; date of birth, 1895. Breeder, Charles McElwain, Bowling Green, Ky. In stud, Morgan Horse Farm, Middlebury, Vt.]
Harrison Chief No. 1606 (S.).
Belle
Clark Chief No. 89.
Lute Boyd
Cabell's Lexington No. (1223).
By
Mambrino Chief No. 11.
Little Nora
Joe Downing No. 710.
Eagle
Gist's Black Hawk No. (1222).
By
King William No. 67 (S.).
Mambrino Paymaster.
Downing's Bay Messenger.
Mrs. Caudle.
Edwin Forrest. No. 49.
Lizzie Peebles.
Robert Bruce.
By Buck Elk.
Blood's Black Hawk. No. (32).
Tom Hal.
By Copperbottom.
Washington Denmark. No. 64 (S.).
Queen. No. 48 (S.).
NALA
[Breed, Standardbred; sex, male; color, bay; height, 15.2 hands; date of birth, 1901. Information from American Horse Breeder, December 3, 1907, page 1150.]
George Telluride
Eliza Jane
Telluride No. 16430.
Harkaway No. 2875.
Hoarhound
Lancelot No. 6830.
Edgewater Belle Vol. IX, A.T.R.
Wilkin's Micawber. No. 339.
Lady Simmons
Francis Alexander. No. 1986.
Ernesta
Messenger Duroc. No. 106.
Green Mountain Maid. Vol. IV, A.T.R.
Edgewater. No. 12730.
Easter, by American Clay No. 34.
Hambletonian. No. 10.
Lady Brown, by American Star No. 14.
Hambletonian. No. 10.
Lady Griswold, by Flying Morgan.
Ben Patchen. No. 1725.
Pacing Abdallah, by Abdallah No. 15.


NEVADA
[Sex, female; color, bay; height, 15.2 hands; weight, 1,085 pounds; date of birth, 1899. Breeder, George D. Rainsford, Diamond, Wyo. In stud, Colorado Experiment Station, Fort Collins, Colo.]
Emigrant
Gila
Lord Winbeam
Lady Spartan
Red Bud (Th.)
Marie Stuart
George Peabody
By
Spartan
Lady Hattie
Tom Bowling
Oleander (Mary Hennessy)
Hambletonian. No. 10.
By Imp. Bellfounder.
Imp. Bellfounder.
Ethan Allen. No. 43.
Nelson.
Lady Fiddler.
Lexington.
Lucy Fowler, by Albion.
Tipperary.
Olio, by Oliver.
ORINDA, No. 4158 (S.).
[Breed, American Saddle Horse; sex, female; color, chestnut; height, 15.1¼ hands; weight, 1,015 pounds; date of birth, May 4, 1898. Breeder, S. Moore, Junction City, Ky.]
Logic No. 917 (S.).
Luella
Stonewall Jackson, jr. No. 947 (S.).
By
Magic No. 1451.
Stonewall Jackson. No. 72 (S.).
King William No. 67 (S.).
By
American Clay No. 34.
Lualada
Washington Denmark. No. 64 (S.).
By Tom Hal. F. S. (S.).
Washington Denmark. No. 64 (S.).
Queen. No. 48 (S.).
Onstot's Telegraph.
By Miller's Denmark.
Cassius M. Clay, jr. No. 22.
By Imp. Tranby.
Berkeley's Edwin Forrest.


ROB ROY, No. (4483).
[Breed, Morgan; sex, stallion; color, chestnut, star and stripe; height, 14.1 hands; date of birth, May 12, 1893. Breeder, Melissa A. Kelley, Bradford, Vt.]
Ethan Allen 2d
By
Peter's Morgan
Nellie
Starlight
By
Peter's Vermont
By
Ethan Allen No. (50).
Stephen Dow's Jennie.
Flying Banner
By
Peter's Morgan
By
Wood Horse, by Green Mountain Morgan.
Stephen Dow's Jennie.
Morgan Hunter 2d.
By General Hibbard.
Black Hawk. No. (20).
Holcomb mare.
Hale's Green Mountain Morgan.
Old Phebe.
Hammett horse, by Black Hawk No. (20).
By Caleb Emery horse.
Rowland colt.
By Hood horse.
Peter's Vermont.
By Morgan Hunter 2d.
Peter's Vermont.
By Morgan One Eye.
SAMUEL STONE ("Promoter"), No. 11265.
[Breed, Standardbred; sex, gelding; color, chestnut; date of birth, 1889. Breeder, Chas. E. Waters, Minneapolis, Kans. Information from J. F. Carlisle, New York, N. Y.]
Norman Medium No. 1937.
Susie Clay
Happy Medium No. 400.
Alice Drake
Talisman No. 1924.
Hazel Pulling
Hambletonian No. 10.
Princess
Norman (Alexander's). No. 25.
By
Cassius M. Clay, jr. No. 22.
Queen Vic
Harry Pulling No. 2581.
Abdallah. No. 1.
Chas. Kent mare, by Imp. Bellfounder.
Andrus's Hambletonian.
Morse Horse. No. 6.
Pilot, jr. No. 12.
Cassius M. Clay. No. 18.
By Abdallah No. 1.
Mambrino Chief. No. 11.
Patsy, by Rudolph.
Menelaus. No. 226.
Bird, by Smith's Ethan Allen.


SIR JAMES
[Breed, Standardbred; sex, gelding; color, chestnut; height, 15.2½ hands; date of birth, 1902. Information from Sports of the Times, November 23, 1907, page 598.]
Bow Bells No. 13073.
By
Electioneer No. 125.
Beautiful Bells Vol. VI, A. T. R.
Red Wilkes No. 1749.
Hambletonian No. 10.
Green Mountain Maid.
The Moor No. 870.
Minnehaha
George Wilkes No. 519.
Queen Dido
Abdallah. No. 1.
Chas. Kent mare by Imp. Bellfounder.
Harry Clay. No. 45.
Shanghai Mary.
Clay Pilot. No. 93.
Belle of Wabash.
Bald Chief (Stevens).
Hambletonian. No. 10.
Dolly Spanker, by Henry Clay No. 8.
Mambrino Chief. No. 11.
TATTERSALL, No. 2007 (S.).
[Breed, American Saddle Horse; sex, gelding; color, bay. Breeder, J. Gano Johnson, Mount Sterling, Ky.]
Bourbon Chief No. 976 (S.).
By
Harrison Chief No. 1606 (S.).
Belle
Red Cloud (Wyatt's) No. 2197 (S.).
By
Clark Chief No. 89.
Lute Boyd
Latham's Denmark. No. 69 (S.).
By
Indian Chief No. 1718 (S.).
By
Rhoderick No. 104 (S.).
By
Mambrino Chief. No. 11.
Little Nora.
Joe Downing. No. 710.
Eagle, by Robert Bruce (Th.).
Washington Denmark. No. 64 (S.).
Queen, No. 48 (S.).
Bellfounder.
Blood's Black Hawk.
Parsons's Abdallah.
By Yellow Jacket No. 112 (S.).
Mambrino Le Grand. No. 99 (S.).
Magic. No. 1451.


WARSHIP ("BLAZE O' GLORY") No. 20526.
[Breed, Standardbred; sex, gelding; color, bay; height, 14.3 hands; weight, 825 pounds; date of birth, 1890. Breeder, Charles Baer, Mendon, Mich. Information from Horse Show Monthly, June, 1902.]
Masterpiece No. 6460.
Jane B
Masterlode No. 595.
Fanny
Lexington Chief, jr No. 2103.
Maggie
Hambletonian No. 10.
Lady Irwin
Magna Charta No. 105.
By
Lexington Chief No. 576.
By
Magna Charta No. 105.
Abdallah. No. 1.
Chas. Kent mare by Imp. Bellfounder.
Morgan Eagle.
Kentucky Clay. No. 194.
Lady Warfield, by Mambrino Chief No. 11.
Fiske's Mambrino, by Mambrino Chief No. 11.
Morgan Eagle.
WYOMING
[Sex, female; color, bay; height, 15.3¼ hands; weight, 1,180 pounds; date of birth, 1896. Breeder, George D. Rainsford, Diamond, Wyo. In stud, Colorado Experiment Station, Fort Collins, Colo.]
Red Bud (Th.)
Lady Shepherd
Tom Bowling
Oleander (Mary Hennessy).
Spartan, jr
Sallie Sloan
Untraced; purchased in New York.
Lexington
Lucy Fowler
Tipperary
Olio
Spartan
Lady Hattie
Boston.
Alice Carneal, by Imp. Sarpedon.
Albion.
By Imp. Leviathan.
Ringgold.
Roxana, by Chesterfield.
Oliver.
Isola, by Bertrand.
Ethan Allen. No. 43.
Nelson.
Lady Fiddler.

THE EFFECT OF CERTAIN DISEASES AND CONDITIONS OF CATTLE UPON THE MILK SUPPLY.

By JOHN R. MOHLER, A. M., V. M. D.,
Chief of the Pathological Division.

INTRODUCTORY.

The reasons for securing a supply of pure and wholesome milk are so numerous and so important that the public should become acquainted with some of the more essential of them in order that assistance may be rendered in bringing about a satisfactory improvement. Public health demands the purity of all milk and milk products. Next to bread, milk is more extensively used as an article of diet than any other foodstuff. It forms a portion of the food of almost every person on practically every day of the year. Furthermore, unlike many other articles of diet, milk is consumed in most cases in an uncooked state, making it a very dangerous food should it perchance contain any deleterious organisms. Not only is milk a very suitable medium for almost every description of germ life which may gain access to it in its journey from the cow to the consumer, but it may also become contaminated while still in the udder through infectious or poisonous material present in the cow herself. In this paper, however, consideration will be given only to the latter aspect of the subject.

In this connection it will be necessary to keep in mind the requirements of an awakened public for a clean and wholesome milk, as well as the effect of any unreasonable or irrational demand upon the producer, which may cause him heavy losses or even to discontinue his business. It will also be apparent that in order to produce milk in compliance with the requirements hereafter described certain precautions must be taken, which will necessarily entail additional expense upon the producer of this higher grade of milk. The customer must therefore expect to pay his portion of any legitimate advance in the cost of production, and such increase in the price of milk due to its improved quality should be considered as money well expended.

Moreover, good milk of safe quality can not be had without a realization on the part of the farmer, the transportation agent, the dairyman, and the housewife of the danger in utilizing old, warm, or dirty milk. Education is therefore an important factor in the improve-

ment of the milk supply, which can not be accomplished through laws and regulations alone. In view of these facts, it is recommended that the subject be taught in the schools, that popular articles be frequently prepared for the press, that lectures and demonstrations be given in towns and townships, that pamphlets in plain language be prepared by the health officer for general distribution, and especially that rules and suggestions, with reasons therefor, be placed in the homes of dairymen and dairy attendants.

DISEASES WHICH MAY RENDER MILK DANGEROUS.

TUBERCULOSIS.

This is probably the most important disease of cows from the standpoint of public health, and it is also the most prevalent. When Koch first discovered the cause of tuberculosis and combined the announcement of his discovery with the statement that he considered the affection identical in both man and cattle, this view was accepted by scientists as well as by the general public. His subsequent announcement in 1901, to the effect that this disease was different in man and in cattle, and that there was no practical need for preventing the use of the products of tuberculous animals for human food, was the cause of much rejoicing among those who were only too glad to grasp at any idea which would tend to separate the disease in man and in cattle, forgetting that bovine tuberculosis is also a dangerous disease to other cattle in the herd and should be stamped out for this reason aside from any danger to man.

As a result of this radical statement of Koch's, which was based upon incomplete and unsatisfactory evidence, several government commissions were appointed in different countries, and many private and public scientists immediately took it upon themselves to solve the question raised by that investigator. The results of these experiments were so strikingly similar that it is now the generally accepted opinion among scientists that people, especially children, may become infected with tuberculosis from cattle. It is not known to what extent such infection occurs, nor is it possible to obtain any definite percentage by the method formerly adopted of looking for the primary lesions in the intestinal canal, although much statistical evidence is recorded, showing that even by these figures primary intestinal tuberculosis of children has been observed in as high at 45.5 per cent of the tuberculous cases examined (Heller). Evidence which must be considered conclusive has been obtained by the Bureau of Animal Industry, as well as by Ravenel and a number of French investigators, showing that tuberculous infection may take place through the intestinal tract without leaving any lesion in the abdominal cavity, the first alteration being found in the lungs or the thoracic glands. Therefore the pres-

ence of pulmonary tuberculosis in infants without intestinal lesions is no indication that the disease was not transmitted by the food, and the statistics above referred to are thus shown to be below the true percentage of cases of tuberculosis of intestinal origin.

EVIDENCE OF TRANSMISSION FROM CATTLE TO PEOPLE.

These figures, however, do not give any satisfactory idea as to whether the bacilli entering the intestines originated from human or bovine sources. Owing to this fact it follows that the only way of determining the infection of people by bacilli of the bovine type is to study the lesions in the body of as many cases of human tuberculosis as possible. Already we have sufficient data to give us some idea of the extent of tuberculosis of the bovine type in children without considering the numerous cases of direct transmission recorded by many physicians, especially of instances of butchers and others receiving accidental infections of the skin with the bovine organism. Moreover, according to Von Behring, the question of infection in man usually goes back to childhood, as he believes that many of the cases of pulmonary tuberculosis in adults are of intestinal origin, infection having occurred primarily through the intestinal tract by drinking tuberculous milk during infancy and having remained latent until adult life. As vital statistics show that 14 out of every 100 people that die succumb to tuberculosis, while of the remaining 86 more than one-half show lesions of tuberculosis on post-mortem, although dying from some other cause, the foregoing statement of Von Behring is also practically pertinent in regard to the relation of human tuberculosis to the milk supply, especially in connection with the results of those investigators who have studied market milk and found from 5.2 to 55 per cent of the samples examined to contain tubercle bacilli.

Since direct experiments upon human beings are out of the question, the finding of the bovine type of tubercle bacillus in human lesions is the most direct and positive proof that tuberculosis of cattle is responsible for a certain amount of tuberculosis in the human family. Numerous experiments with this object in view have already proven this fact. Thus the German Commission on Tuberculosis examined 56 different cultures of tubercle bacilli of human origin and found 6 which were more virulent than is usual for human tubercle bacilli, causing marked lesions of tuberculosis in the cattle inoculated with them, and making over 10 per cent of the cases tested that were affected with a form of tuberculosis which, by Koch's own method, must be classified as of bovine origin. The bacilli, with the exception of a single group, were all derived from the bodies of children under 7 years of age, being taken from tubercular ulcers in the intestines, the mesenteric glands, or from the lungs.

In a similar series of tests conducted by the British Royal Commission on Tuberculosis, 60 cases of the disease in the human were tested, with the result that 14 cases were claimed by this commission to have been infected from bovine sources. Ravenel reports that of 5 cases of tuberculosis in children 2 received their infection from cattle. Theobald Smith has also reported on 1 culture of the bovine tubercle bacillus obtained from the mesenteric glands of a child out of 5 cases examined, and according to a recent paper by Goodale, Smith has recently been at work on 7 other cultures from different children, 4 of which conformed to his idea of tubercle bacilli emanating from cattle. Of 4 cases of generalized tuberculosis in children, examined in the Biochemic Division of the Bureau of Animal Industry, 2 were found to be affected with very virulent organisms, which warranted the conclusion that such children had been infected from a bovine source. The Pathological Division of the same Bureau has likewise, out of the 9 cases of infantile tuberculosis examined, obtained two cultures of tubercle bacilli that could not be differentiated from bovine cultures. In Europe so many similar instances of bovine tubercle bacilli having been recovered from human tissues are on record that it appears entirely proven that man is susceptible to tuberculosis caused by animal infections, and while the proportion of such cases can not be decided with even approximate accuracy, it is nevertheless incumbent upon us to recommend such measures as will guard against these sources of danger.

MILK AS A CARRIER OF TUBERCULAR INFECTION.

The two principal sources of infection from cattle, and the only ones necessary to be considered, are the meat and milk of tuberculous animals. The fact that most of the cases of bovine tuberculosis above enumerated which occurred in the human occurred in infants points with grave suspicion to the milk rather than the meat supply. This naturally leads to the question of how and under what condition does the milk become dangerous, since Bang, Rabinowitsch and Kempner, Ernst, Ravenel, Smith, MacWeeney, Moussu, Gehrmann and Evans, Mohler, and many others have definitely determined the infectiveness of milk from tuberculous cows.

That milk coming from a tuberculous udder is capable of transmitting the infectious principle is conceded by all who have given the subject any consideration. It has been equally established that in advanced generalized tuberculosis the udder may secrete tubercle bacilli without showing any indication of being affected. Careful experiments performed by trained and eminently responsible investigators have also demonstrated beyond reasonable doubt that tubercle bacilli at certain times may be present in the milk of cows affected with tuberculosis to such a slight degree that the disease can

be detected only by the tuberculin test, so that in a herd of cows in the various stages of tuberculosis it is to be expected that some of them will secrete tuberculous milk, which, when mixed with other cows' milk, makes the entire product dangerous.

In this connection it may be stated that the market milk of the District of Columbia has recently been examined by the writer for the presence of tubercle bacilli by the intra-abdominal inoculation of guinea pigs, and in 2 samples, or 2.7 per cent of the 73 specimens tested, virulent tubercle bacilli were recovered. The ease with which tubercle bacilli may be eliminated by the udder was strikingly illustrated by an experiment conducted by the Royal British Commission, in which a cow injected with human tubercle bacilli under the skin of the shoulder began excreting tubercle bacilli from the mammary gland seven days later, and continued to do so until its death from generalized tuberculosis thirty days after inoculation.

It has been shown by Gaffky and Eber in Germany and Schroeder in this country that, even when the tubercle bacilli are not being excreted by the udder, the dust and manure of the stable where the diseased animals are kept are in many cases contaminated with tubercle bacilli. This contaminated material may readily infect the milk during the process of milking, even though the milk comes from a healthy cow. The importance of this method of infecting milk can not be too greatly emphasized when it is known that cattle in prime condition, without any udder lesions and with but slight alterations in the lungs, frequently raise tuberculous mucus into the pharynx while coughing, then swallow this material and thus contaminate the feces. In a recent examination at the Bureau of Animal Industry Experiment Station of the manure passed by 12 cows just purchased from dairy farms supplying milk to the city of Washington and affected with tuberculosis to an extent demonstrable only by the tuberculin test, tubercle bacilli were found in over 41 per cent of the cases, both of microscopic examination and animal inoculations. The danger from this method of infecting milk is impressed upon us as consumers when we consider the prevalence of tuberculosis in dairy herds as disclosed by numerous tests.

PREVALENCE OF TUBERCULOSIS AMONG COWS SUPPLYING MILK TO THE DISTRICT OF COLUMBIA.

Judging from the results of recent tuberculin tests, it is believed that on an average probably 25 per cent of all the cows which supply milk to the District of Columbia are tuberculous. During 1907 the Bureau of Animal Industry supervised the testing of 1,538 cattle in 104 herds supplying milk to the District, with the result that 260, or 16.9 per cent, were found tuberculous. Many other tests have been made by local veterinarians of which the Bureau has no records.

The percentage given is scarcely a fair estimate of the extent of tuberculosis in the dairy herds of this vicinity, since our tests include many herds which have either been cleaned previously by private tests or which have such a healthy appearance as to remove all suspicions of tuberculosis on a physical examination. Thus far these tests have all been voluntary on the part of the dairymen, and it is pleasing to note the large number who have had their herds cleaned of tuberculosis and the premises disinfected.

DANGER FROM TOXIN IN MILK OF TUBERCULOUS COWS.

Aside from the danger of tubercle bacilli in milk, some investigators (Le Blanc, Ripper, Jemma, and De Michele) consider the milk of tuberculous cows dangerous even when bacilli are not present, on account of the toxin it contains. Michellazzi has injected such milk into tuberculous animals and obtained a reaction.

ELIMINATE TUBERCULOUS CATTLE OR PASTEURIZE MILK.

To eliminate all tuberculous cattle from the herd or to pasteurize all milk coming from untested cattle should therefore be the object of all producers of milk, and sanitarians will be remiss in their whole duty should they neglect to guard against the products of tuberculous animals in their attempts to eradicate tuberculosis from man.

TUBERCLE BACILLI IN OTHER DAIRY PRODUCTS.

Since milk is so often infected with tubercle bacilli, it is very evident that food products made from milk without submitting it to lethal temperatures during the process of their manufacture must frequently harbor virulent tubercle bacilli in undesirable numbers.

The investigations of Rabinowitsch, Klein, Laser, Bang, Petri, Dawson, Markl, Möller, and many others have conclusively shown that tubercle bacilli may be present in butter, buttermilk, margarin, and cheese when these products are offered for sale. Butter made in the customary manner and stored under the ordinary market conditions until time of sale, if dangerous through the presence of tubercle bacilli at the time of its manufacture, may retain its virulence through several months. This statement has been adequately proved by two series of experiments recently performed by the Bureau of Animal Industry.

In one series by Mohler, Washburn, and Rogers three samples of butter were tested. The first was made from milk to which bovine tubercle bacilli had been added just before churning. They were obtained from a luxuriantly growing culture upon glycerin bouillon. Ten centigrams were removed from the surface growth of the flask, carefully mixed in a sterilized solution, and added to 10 gallons of

milk. The second sample was made from milk obtained from a cow affected with tuberculosis of the udder. In this milk tubercle bacilli of extreme virulence were present in great numbers. Both the first and second samples of butter were salted in the usual proportions of 1 ounce of salt to a pound of butter. The third sample was similar in every respect to the second, except that it was left unsalted. These samples of butter were tested upon guinea pigs, not only when first made, but also after storing for ten days in the ice chest, after holding in cold storage for sixty days, and again after retention in cold storage for a period of five months (153 days). The results showed that each of these samples harbored virulent tubercle bacilli throughout the entire storage period, and that at any time they were capable of infecting guinea pigs with tuberculosis if injected into the peritoneal cavity, and if the tuberculous butter was fed to the animals generalized cases of tuberculosis were still capable of being developed. In these experiments 10 guinea pigs were fed upon each butter sample for three consecutive days and 6 were inoculated with the same kind of material. Six weeks later they were chloroformed and the visceral organs of each were carefully scrutinized that every trace of tuberculosis might be detected. None of the lots of guinea pigs remained entirely free of tuberculosis, although those animals which were fed upon the contaminated butter failed to contract the disease as generally as those which were injected. This experiment is to be extended further in order to determine the maximum time in which infected butter, both salted and unsalted, will remain virulent when kept in cold storage under normal trade conditions. As the temperature in the cold-storage rooms is very low, the evidence shows that the tubercle bacilli are held unchanged in the frozen butter for a long period, but that they slowly lose their vitality.

In another series of experiments by Schroeder and Cotton, of the Bureau Experiment Station, butter was made from the milk of a cow affected with udder tuberculosis. After salting at the rate of 1 ounce of salt to a pound of butter, the butter was kept without ice in a cellar in which the temperature remained fairly constant at 60° F., and from time to time, up to one hundred and thirty-three days from the making of the butter, guinea pigs were inoculated with portions of the butter. More than 50 guinea pigs were thus inoculated and, with the exception of 5 that died prematurely and 1 that was killed, all died of generalized tuberculosis, and the one that was killed was also found affected.

In cheese also tubercle bacilli may become mixed up with the curd during the process of manufacture, and they have been shown to remain virulent for over three months. As a result of Galtier's experiments conducted with cheese, both salted and not salted, which was found to contain tubercle bacilli when two months and ten days old,

he concluded that coagulated milk, fresh cheese, and salted cheese made from the milk of tuberculous cows may infect man, and that the by-products fed to swine and chickens may infect these animals. In experiments made in Switzerland to determine the fate of tubercle bacilli in cheese it was demonstrated that they died between the thirty-third and fortieth day in cheese made after the Emmental method, but considerably later in cheese made approximately after the Cheddar method. An emulsion of tubercle bacilli was added to milk at the same time as the rennet, and cheese was made from the milk in the manner required to obtain Cheddar cheese. From the time of manufacture average samples of the cheese were taken weekly, macerated in sterile water, and filtered. Guinea pigs were inoculated with portions of the filtrate, and it was found that the germinating power of the tubercle bacilli lasted one hundred and four days, but after one hundred and eleven days they were incapable of conveying the disease to guinea pigs by inoculation. Harrison concluded that these experiments justify the statement that Emmental cheese may be eaten with safety, as the period of ripening is much longer than the period during which the bacilli become innocuous. Cheddar cheese, he states, is seldom eaten under four months from time of manufacture, and during this period the tubercle bacilli lose their vitality. Notwithstanding this, however, the writer recommended the pasteurization of the milk in order to make the cheese absolutely safe.

In manufacturing margarin the method commonly employed is to subject the finely comminuted fat to a temperature not to exceed 50° C. for one and one-half hours. Sour milk is then added and the whole mass is thoroughly mixed; dairy butter is next added, and a certain proportion of oils (cotton, palm, cocoanut, etc.). Enough of one or more of these oils is added to lower the melting point to that of dairy butter. Hence it will be seen that artificial butter thus made may be infected in three ways: First, from the fat secured from the original cattle, as tubercle bacilli will withstand a temperature of 50° C. for some hours; second, from the butter or soured milk that has been added; and, third, from contamination during the course of its manufacture. Morgenroth made examinations of 20 samples of oleomargarin, purchased in the open market, and proved the presence of virulent tubercle bacilli in 9 of the specimens.

Other products which occasionally are consumed by people, but are used more extensively as food for live stock, will also serve to convey tubercle bacilli from infected milk to those that are allowed to consume them. Thus, whey from cheese factories and buttermilk and separated milk from public creameries are all offenders in this respect and have been incriminated, especially in the feeding of hogs and calves.

ACTINOMYCOSIS.

This disease, while not at all infrequent in the maxillary regions of cattle, is quite rarely located in the udder. It is readily mistaken for tuberculosis, owing to the diffuse lesions and the character of the pus. While no known case of actinomycosis in man has been traced to the milk, it is nevertheless advisable to condemn the milk from an infected udder, especially since the virus of the disease in man, in most cases, has been found to enter the body through the alimentary canal. Furthermore, there is usually in actinomycosis a mixed infection with pus-producing cocci, which emphasizes the necessity for prohibiting the use of the milk from such udders.

BOTRYOMYCOSIS.

Botryomycosis of the udder is only occasionally met with, but when it is observed the utilization of the milk therefrom should not be permitted. The disease is chronic and is accompanied by new connective tissue formation and burrowing sinuses from which pus escapes. Mixed infection is liable to occur in this disease also, which adds to the danger of consuming the milk.

FOOT-AND-MOUTH DISEASE.

This affection is transmissible to man through the consumption of milk from diseased animals. While the disease is quite prevalent on the Continent of Europe and in other parts of the world, it has not often reached the United States.

ANTHRAX.

In this disease the milk has an abnormal appearance and decomposes rapidly. The bacterium of anthrax has been recovered from milk fourteen days after it had been taken from an infected cow, which illustrates the importance of prohibiting the use of milk from such animals.

COWPOX.

This disease, which is probably becoming more common in this country, renders the milk unfit for food, and its distribution from cows so affected should not be permitted, inasmuch as the milk may become contaminated from the pustules and ulcers on the teats and in the sinuses of the udder, and produce infection by the alimentary canal of young children if it is consumed in a raw state.

The appearance of dark-brown crusts on the teats and udders of cattle is suggestive of several conditions and should be carefully ex-

amined, particularly since the isolation by Dean and Todd of an organism identical with the Klebs-Loeffler bacillus from such lesions as well as from the milk. Diphtheria is not a disease of cattle, but it is possible for an abrasion to become infected with this organism from a human origin and the local lesion to spread until it involves the milk sinuses. It was also suggested that this udder lesion might be due to an infected milker following the all too common habit of spitting on his hands before commencing to milk, and the bacillus passing up the milk duct might thereby infect the sinus.

RABIES.

The virus of rabies has in several instances been reported to have been passed to the offspring through the mother's milk. While it is not probable that cattle would be milked after the symptoms of rabies developed, it is nevertheless important to realize the danger of using such milk and the necessity for preventing calves from sucking such diseased cows.

MAMMITIS, MASTITIS, OR GARGET.

This disease or series of diseases of the udder is by far the most frequent alteration noted. Usually only one quarter is affected, although the whole udder may at times be involved. The affected parts are greatly swollen and more or less painful in the early stages. The milk, at first normal in appearance, soon changes its character, becoming watery, light brown in color, and in some cases contains flocculi and pus cells, and appears tenacious, slimy, or ropy. The cause of this condition is usually a streptococcus, although staphylococci are frequently incriminated in suppurative conditions of the udder, especially where abscess formation occurs. The milk from such an udder is objectionable from an esthetic standpoint and is also liable to give rise to gastro-intestinal disorders, especially in children. Such milk should be prohibited until the inflammatory condition entirely disappears.

LEUCOCYTES IN MILK.

The number of leucocytes in milk and their significance are receiving the serious attention of those bacteriologists who are striving for a purer milk supply. The question as to what number of leucocytes should be regarded as abnormal is still the subject of investigation, but the opinions of contemporaneous workers are becoming more uniform as the methods for the determination of these leucocytes are reaching greater perfection. Previously it was considered that but few leucocytes were contained in the milk of healthy cows, and when a certain increased number of leucocytes were observed in

milk it was suggestive of inflammation of the udder, termed mammitis or garget. As the milk in this disease may contain pus without changing the appearance of the product, such milk may readily be accepted by the consumer as normal. It is therefore of importance to be able to designate the cows and the milk so affected, especially as the causative agents of this condition are micrococci, which likewise produce intestinal disorders when consumed by infants. Even when the udder inflammation is slight an increase in the number of leucocytes secreted in the milk may be observed, and it was the recognition of this fact which has caused the introduction of microscopic examination of the milk for the determination of the presence or absence of garget. However, with the technique at present employed in the numerical determination of leucocytes there is too narrow a margin between the leucocytes found in the milk of healthy and those in diseased cows to make this form of diagnosis satisfactory and practicable. This is particularly true of milk from healthy cows during the first week of lactation, although at this time the normal increase of leucocytes would be accompanied by colostrum corpuscles. While the several methods recommended by different investigators are not directly comparable, it is nevertheless evident that an entire lack of harmony exists at present among them which makes the reliability of one or more of the methods at least doubtful. The Doane-Buckley and Trommsdorff methods are probably the most preferable, but neither of these is perfect and should not be depended on per se for the determination of udder inflammations by the examination of market milk or even the mixed milk of a herd.

GASTRO-ENTERITIS.

The milk of cows affected with gastro-enteritis is of an abnormal character, being watery, of bitter taste, and changes quickly to a "sweet curdle." This milk is liable to produce digestive disturbances in the consumer and should not be utilized.

MILK SICKNESS.

A rather peculiar disease called "milk sickness" is found in the central part of the United States, where it at times occurs as an epidemic among cattle and people. In cattle the first indication of disease is dullness, followed by violent trembling and great weakness, which increases during the succeeding day until the animal becomes paralyzed and dies. Through the ingestion of flesh, milk, or dairy products of an affected animal the disease is transmitted to man or to another animal, and attacks produced in this way most frequently prove fatal. In man the disease develops with marked weariness, vomiting, retching, and insatiable thirst. Respirations become labored,

peristalsis ceases, the temperature is subnormal, and the patient becomes apathetic. Paralysis gradually follows and death takes place quietly without rigor mortis.

Many efforts have been made to elucidate the question regarding the nature and cause of this disease, but although many theories have been discussed none of them has so far been generally accepted. Some investigators hold that the disease is of micro-organismal origin, some that it is due to autointoxication, while others think it is caused by vegetable or mineral poisons. All seem to agree, however, that the disease is limited to low, swampy, uncultivated land, and that the area of the places where it occurs is often restricted to one or a few acres. Furthermore, when such land or pastures have been cultivated and drained the disease disappears completely.

From the above facts it seems evident that milk sickness is an infectious disease communicable to man, and the cattle owners should therefore not be permitted to make use of the meat or milk of affected animals for human consumption.

SEPTIC OR FEBRILE CONDITIONS.

The presence in the dairy of cows affected with such septic conditions as puerperal sepsis, septic metritis, diffuse phlegmon, suppurative wounds, and extensive ulcerations constitutes a grave danger to the milk supply, inasmuch as the milk may become infected with the pus-producing organisms, among which the streptococci are capable of causing enteritis in man. The milk of cows suffering from febrile conditions, especially when associated with sepsis, should also be excluded. In the case of small single wounds which cease to suppurate, the milk may be used without danger, providing the teats and udder are well cleaned before each milking.

ABNORMAL APPEARANCE AND CONDITIONS OF MILK.

The udder acts as a natural emunctory, like the kidney, and in consequence of its natural selective powers certain active principles contained in various foods, drugs, and poisons are eliminated thereby.

SLIMY, STRINGY, OR ROPY MILK.

These conditions of the milk are not an uncommon occurrence and sometimes are produced by a diseased condition of the udder of the cow, although in the majority of cases these abnormal appearances of milk are caused by various kinds of bacteria infecting the milk after it has left the udder. While this altered milk may be perfectly wholesome, it is nevertheless unpalatable, and most consumers in this country would rather do without than drink such material.

BITTER MILK.

This condition in the milk is second in importance only to the slimy milk and causes much trouble to the dairyman. Bitter milk may originate from two different sources. The first source is dependent upon the cow, while the second is due to the growth of bacteria in the milk after it has been drawn from the animal. The difference between these two classes of bitter milk is that the first has a decidedly bitter taste when freshly drawn, while the second class is sweet when taken from the cow, but the bitterness occurs after standing for a short time and increases in intensity. Only the former will be dealt with here. Bitter milk, when produced in the cow, may result from improper feeding with such herbs as lupines, wormwood, etc., or with raw Swedish turnips, cabbages, etc. Bitter milk may also be observed during the late stage of lactation and has followed the infection of teat ducts with bacteria which act on the proteids as an enzyme, converting them into peptones and other products to which the bitter taste is probably due.

COLORED MILK.

Red milk may be produced by the effects of bacteria, but is usually the result of a mixture of blood with the milk, due to an abrasion of the udder or teats or to some other traumatism of the udder. It may also be due to the cow eating material containing a large amount of silica, as sedges, rushes, etc., or to plants containing red pigment, as madder root. Other plants which are said to impart color to milk are alkanet, field horsetail, meadow saffron, and knot grass. *Bacillus cyanogenes*, the cause of blue milk, at times gets into the udder through the milk ducts and leads to a bluish discoloration of the secretion.

TASTE AND ODOR.

The flavor of milk is very readily affected by the character of the feed, as, for instance, by turnips, garlic, wild onions, moldy hay and grain, damaged ensilage, and distillery grain. The latter is said to cause hyperacidity of the urine and consequent eczema. With proper precautions, however, these substances can be fed to dairy cattle without producing ill effects in the milk. The deleterious substances excreted with the milk are usually volatile oils contained in the food. They are found in the milk as well as in the body, generally in the largest quantity during the digestion of the food containing them, being eliminated rapidly through the various excretory channels. Thus, if these substances are fed eight or ten hours before milking, or if cattle in the spring are removed from the pastures containing garlic this length of time before milking, there will be little or no

danger of contaminating the milk. Overkept, fermented, and soured feeds tend to produce acidity and other changes in the milk. Swill, spoiled gluten meal, and ensilage put up too green are all more or less injurious to milk. Distillery swill, in addition to the bad flavor which it gives the milk, may cause the secretion of small quantities of alcohol in the fluid. That such alcoholic milk is deleterious to children as well as to the calves and lambs fed on it is a well-known and accepted fact.

Milk is also modified very sensibly by the use of certain medicines, and the list of drugs which are excreted in the milk and give it an abnormal odor or flavor or render it deleterious to the consumer is quite lengthy. Among the more important may be mentioned opium, all volatile oils, purgative salts, rhubarb, arsenic, mercury, lead, zinc, iron, creolin, scammony, iodin, potassium iodid, antimony, bismuth, ammonia, and certain acids.

POISONOUS MILK.

Toxic properties may be manifested in the milk of cows that have eaten certain poisonous plants. Thus, poison ivy (*Rhus toxicodendron*) produces a condition in cattle during which the milk is capable of producing in the consumer severe gastro-intestinal symptoms with weakness. Leaves of the common artichoke are also said to produce certain toxic properties in the milk which result in abdominal pains and diarrhea in the person consuming it.

COLOSTRUM.

Milk should not be used within fifteen days of parturition or during the first five days after parturition. All cows should be dried off at least fifteen days before calving, not only for the sake of the animal, but also on account of the poor quality of such milk at that time. This milk before and after parturition is called "colostrum," and is a yellow, viscid fluid of a strong odor, bitter taste, and acid reaction. The ingestion of such milk is liable to produce diarrhea, colic, and other digestive disturbances.

RECOMMENDATIONS.

In view of the facts above enumerated the following recommendations are made as a basis for laws and for regulations by public health officers:

1. That all cows on dairy farms producing milk for market purposes be tagged, tattooed, or otherwise marked for identification.

2. That all milk produced on such dairy farms shall either come from tuberculin-tested cattle, which shall be retested at least once a

year, or be subjected to pasteurization under the supervision of the health authorities in case the herd is not tuberculin tested.

3. That no additions to any herd, whether the herd has been tested or not, shall be made in the future without subjecting the additional cattle to the tuberculin test.

4. That no license for the sale of milk shall in future be granted except to applicants having herds free of tuberculosis.

5. That the milk of cattle showing any of the udder affections above mentioned, or anthrax, rabies, gastro-enteritis, septic conditions, or clinical symptoms of tuberculosis, shall not be utilized as human food, even though the milk be pasteurized. Milk from cows fifteen days before and five days after parturition and that from animals receiving any of the deleterious medicaments or foodstuffs previously mentioned shall likewise be excluded.

6. That veterinary inspectors of the health department make frequent visits to dairies having untested herds, in order that they may discover all advanced cases of tuberculosis, or udder tuberculosis, as early as possible.

7. That the various States pass laws granting an appropriate indemnity to all owners of tuberculous cattle which come under their respective jurisdictions, the said animals to be slaughtered in abattoirs having Federal inspection.

SOME IMPORTANT FACTORS IN THE PRODUCTION OF SANITARY MILK.

By Ed. H. Webster,
Chief of the Dairy Division.

INTRODUCTORY.

It is evident that in nature's scheme for the nourishment of the young milk was never intended to see the light of day, and if sucked from a normal, healthy gland it is the perfect food for the offspring. In this natural method of nourishment there is little possibility of contamination from outside sources. As soon as the artificial method of drawing milk is resorted to, however, there enters a whole set of conditions entirely new and different. The milk then comes in contact with the air, the vessel into which it is drawn, and with particles of dirt from many sources.

Milk properly drawn, from healthy cows, in clean surroundings, handled in a sanitary manner, and delivered to the consumer in a comparatively short time, is free from disease-producing organisms and is ideal as a food. The problem of securing clean milk—i. e., milk as near as possible to the condition as it exists in the udder—is the problem of dairy sanitation. To put it in another way, it is the problem of reducing contamination from all outside sources to the least possible factor. Few cows, however, are properly milked; many herds are not free from disease; many farmers understand but little of sanitary methods, and but a small proportion of the milk coming into any city of considerable size can be delivered to the consumer soon after milking.

HOW MILK IS CONTAMINATED.

If the mere presence of solid particles of dirt so frequently found in the milk were the only damage wrought, the question would resolve itself into the simple operation of straining the milk or passing it through a clarifier. The presence of solid dirt is, however, an indication of much more serious conditions. Bacteriology teaches that every particle of dirt, whether it seems to the eye a source of contamination or not, carries with it great numbers of bacteria, and that milk at ordinary temperatures, 65° to 100° F., is an excellent medium for their growth, and most of the changes that take place in milk can be traced directly to such action. Neither straining nor clarifying will remove the bacteria from the milk; hence the necessity of keeping the dirt out, not straining it out.

From the act of milking to the final consumption of the milk the possibilities of contamination are many and varied in character. Everything that comes in direct contact with the milk may be a source of trouble, and many things may act indirectly and seriously affect the results desired.

Contamination usually begins with the act of milking. If the udder and flanks of the cow are covered with the dirt of the yard or stable the process of milking will dislodge a greater or less portion of this filth, causing it to fall into the pail. The amount of filth that may be on a cow will depend very much on the conditions of the stable yard and the floor, gutter, and bedding in the stables. (See figs. 21, 23, 25, and 27.)

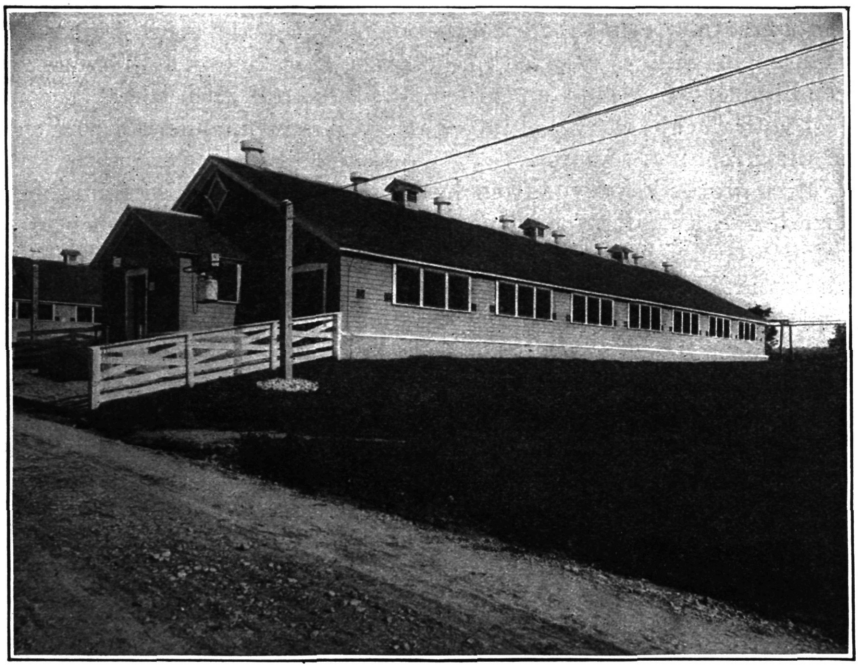


FIG. 20.—Exterior of a model dairy barn.

As to the amount of filth that will get into the milk and its effect on the product, reports from the Illinois Experiment Station and the Storrs (Conn.) Experiment Station are here quoted:

The average weight of dirt which falls from muddy udders during milking is 90 times as great as that which falls from the same udders after washing, and when udders are slightly soiled it is 32 times as great.[a]

Wiping the flank and udder of the cow with a damp cloth just before milking is a very efficient method for reducing the number of bacteria which falls into the milk pail.[b]

[a] Illinois Experiment Station, Bulletin 84.

[b] Storrs Experiment Station, Bulletin 42.

An average of 13 experiments at the Storrs station showed the following results:

Bacteria in milk from unwiped udders per cubic centimeter	7,058
Bacteria in milk from wiped udders per cubic centimeter	716
Decrease due to wiping	6,342

The milker may not be cleanly in person or dress; he may have that most filthy of habits, milking with wet hands. The hands are usually wet by milking a few streams over them, and kept wet by repeating the operation from time to time. The filth on the udder will ooze out under and through the fingers and drip into the pail. This condition is frequently met in inspection work.

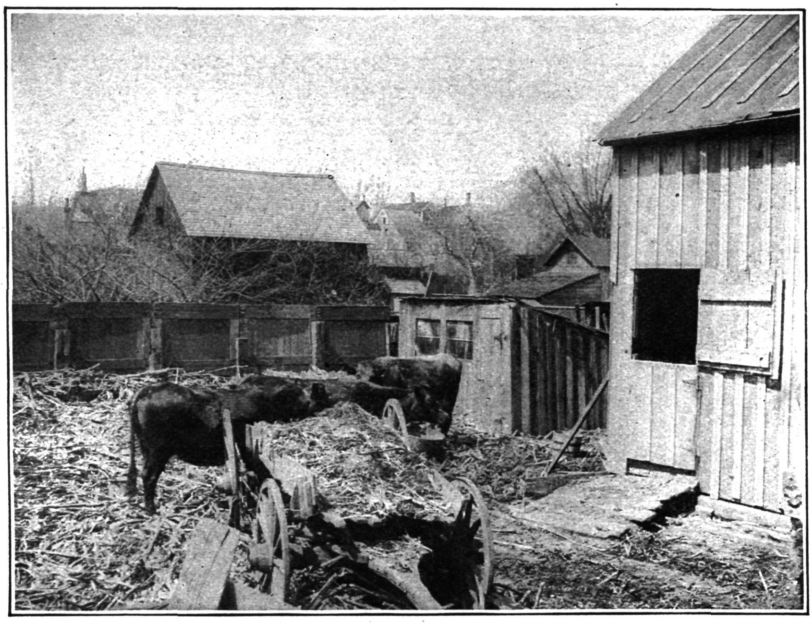


FIG. 21.—Insanitary barnyard. Manure and filth evident everywhere. It is impossible to keep cows clean in such surroundings.

Milkers too often wear clothing that has done duty for every other work about the farm. Such clothing may contain dirt from the hog pen, the chicken coop, the horse barn, or the swill barrel, and is entirely unfit to be worn during milking. A clean white milking suit has a twofold effect. It will not of itself contaminate the milk, and if the milker is required to keep such a suit clean he must of necessity keep everything with which he comes in contact clean.

The difference in results between different milkers working under the same conditions is strikingly illustrated by Stocking.[a] The average of 19 tests in which 2 milkers who had had no training in

[a] Storrs Experiment Station, Bulletin 42.

dairy sanitation and 1 milker who was a graduate of the Connecticut Agricultural College showed 17,105 bacteria per cubic centimeter for the untrained men and 2,455 for the trained man. The only difference between the men was the knowledge of what constituted contamination, gained by the college graduate, who was a student of bacteriology.

EDUCATION AND REGULATIONS.

This example well illustrates the difficulty encountered in securing clean milk by means of police regulations only. Education must go first, and the police authority should be used only in cases where the

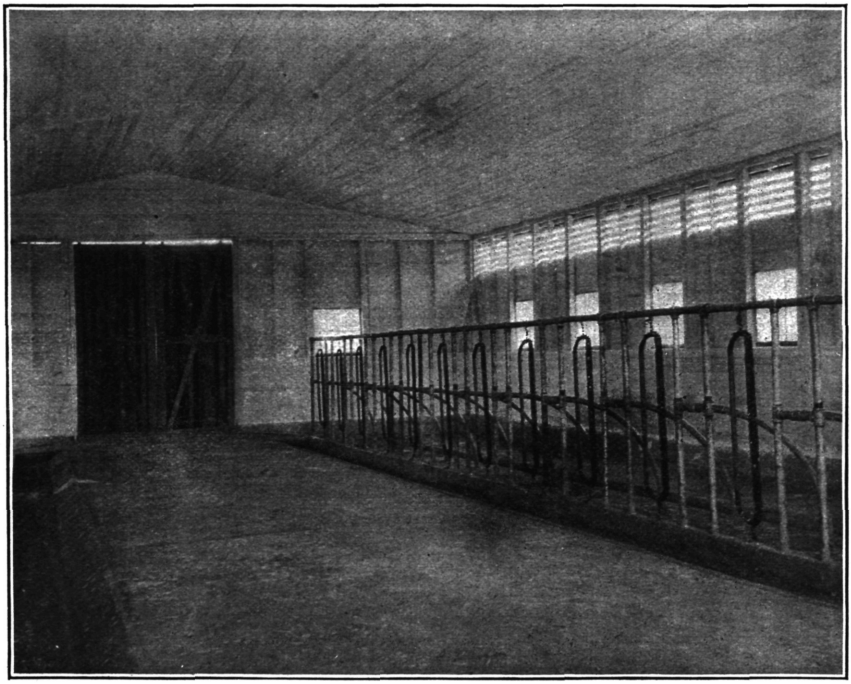


FIG. 22.—Interior of an inexpensive but good dairy stable. Well lighted and ventilated and easily kept clean.

dairyman persists in willfully disregarding sanitation when he knows better. But little improvement will come through regulations requiring clean cows, clean milkers, and clean methods of milking and of handling the milk unless the dairyman understands the object of such regulations and the effect they will have on his work. The officers in charge of inspection must be teachers first and policemen only when they find that the dairyman will not live up to the instructions given him and his knowledge of what is right.

Rules and regulations intended to correct evils often fail in their purpose because of injudicious administration on the part of health

officers, but much oftener from the fact that a man who is by nature filthy in his habits can not be legislated into cleanliness. If he is willing to drink at his own table milk which contains only a little cow dung, he takes it as an infringement of his personal rights and liberties if the authorities attempt to compel him to keep such material out of the milk that goes to his neighbors.

The illustrations accompanying this article are all made from photographs taken in the course of inspection work, and have been selected with a view to presenting a contrast between desirable and undesirable conditions of milk production. They show that more rigid inspection is absolutely necessary, that competent inspectors

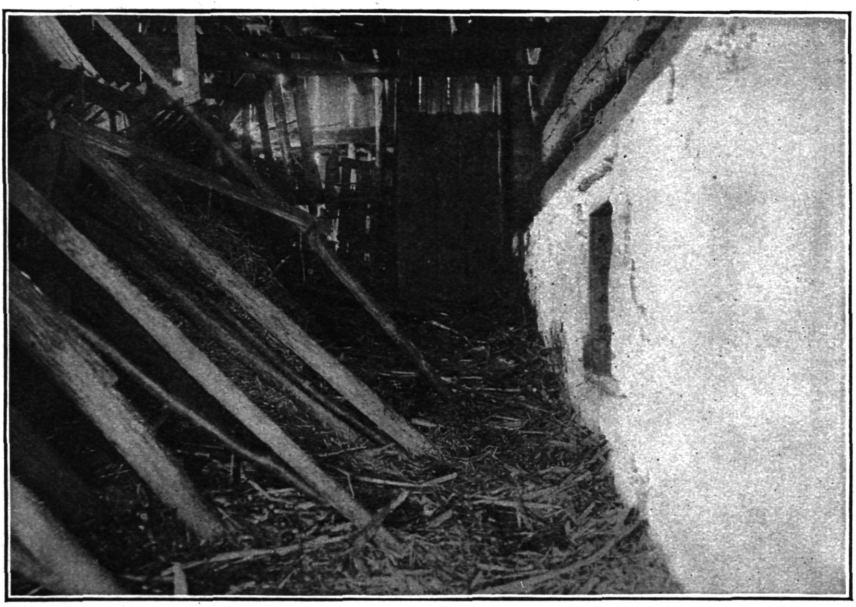


FIG. 23.—Interior of an insanitary dairy stable. It is impossible to avoid contaminating milk drawn in such a place.

must be employed to instruct, and, where instruction is not sufficient, to demand a better state of affairs. Laws and ordinances must be strengthened and the public educated to demand clean milk from clean dairies.

One important item that must be borne in mind is the fact that to change these conditions must cause some expense to the producer, and the consumer must expect to foot the bills. A prominent veterinarian in Kansas City, Mo., recently said in regard to the milk supply of that city that the prevailing price of milk was based on a system which required only that the solid and coarsest dirt be strained out. If the consumer wanted milk that had been kept free from such contamination he would have to pay for the added cost of production.

UTENSILS, EQUIPMENT, HOUSES, ETC.

The milk pail should be made so as to reduce to a minimum the amount of dirt and hair that can get into it during the operation of milking. The form with a wide top is in most common use and is most objectionable. The narrow top, in some form or other, will undoubtedly, in time, replace the wide top. Pails and all other vessels designed to hold milk should be seamless if possible, and where seams must occur, they should be flushed full and smooth with solder. There should be no place either inside or out that can not be reached with the brush in washing. Heavily tinned utensils are recognized

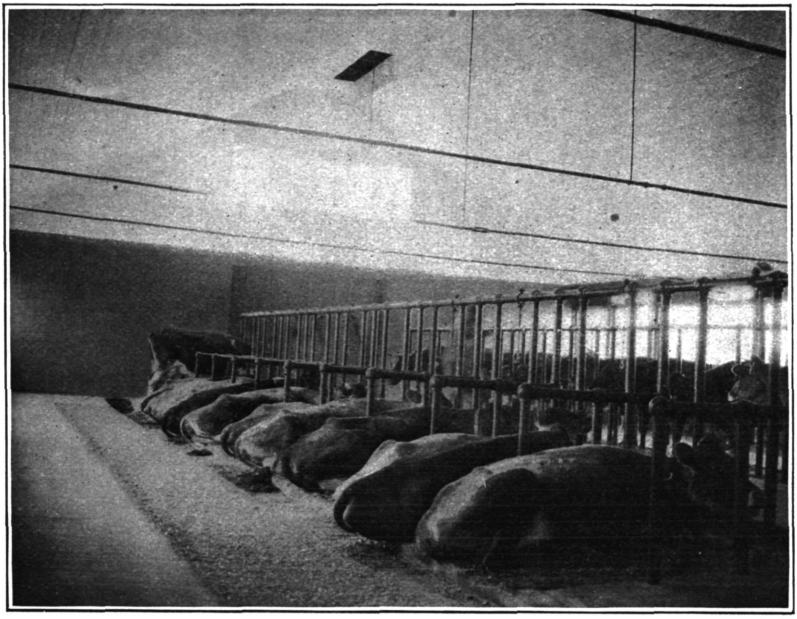


FIG. 24.—Clean cows in clean, comfortable, light, and airy stalls.

as the best for milk purposes. Wood, galvanized iron, or any material that is rough or porous is unfit for milk vessels.

No important part of the dairy work is so often neglected as the cleaning of the milk utensils. It can not be too strongly emphasized that dairy utensils must, after the milk is washed from the surface with warm water, be scalded with boiling water or steam. Nothing short of this will insure clean milk.

Milk after being drawn should be removed at once from the barn to a clean place for cooling. The milk house should be provided with an ample supply of hot and cold water, the necessary cooler, and other apparatus and supplies for handling milk. The surroundings

of the milk house should be neat and clean and the air at all times free from objectionable odors. Cement finish on the interior is better than wood, but success is due to the scrupulous cleanliness observed, and under these conditions the wood is unobjectionable.

CARING FOR THE MILK.

The bacterial content of milk at any time depends upon the age of the milk, the initial number of bacteria introduced through the processes of milking and handling, and the temperature at which the milk has been kept. Consequently clean milk, quick cooling, and short

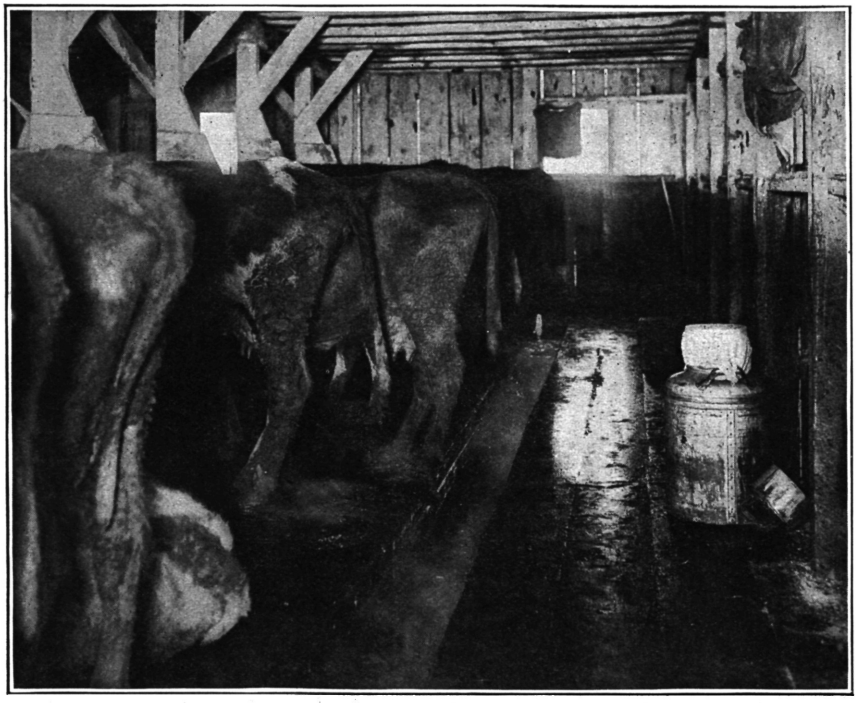


FIG. 25.—Cows coated with filth in a dirty stable. Much of this filth gets into the milk.

time between milking and consumption are very important factors in securing pure milk. A careful survey of the milk supply of a number of cities indicates that not enough attention is paid to these factors by either producers, distributers, or inspection authorities. Milk should be cooled immediately and kept cool until it is consumed. Between the farm and the consumer often several agencies are employed. Hauling to the depot, holding at the shipping point, transportation on the cars, and the handling in the city milk plants are steps in the process of supplying a city that need intelligent and conscientious care

All that has been said about cleanliness, surroundings, and care in handling milk on the farm applies to the city plant where milk is received and distributed to the consumer. So far as insanitary surroundings are concerned, it is usually the smaller dealers who are the greatest offenders. They usually lack facilities for scalding or sterilizing bottles and utensils, and depend too much on the help of the family, often children, to wash bottles and utensils and do much of the work of the dairy.

DAIRY INSPECTION.

For an efficient system of dairy inspection it is recommended that there be an inspector for approximately every 100 dairy farms.

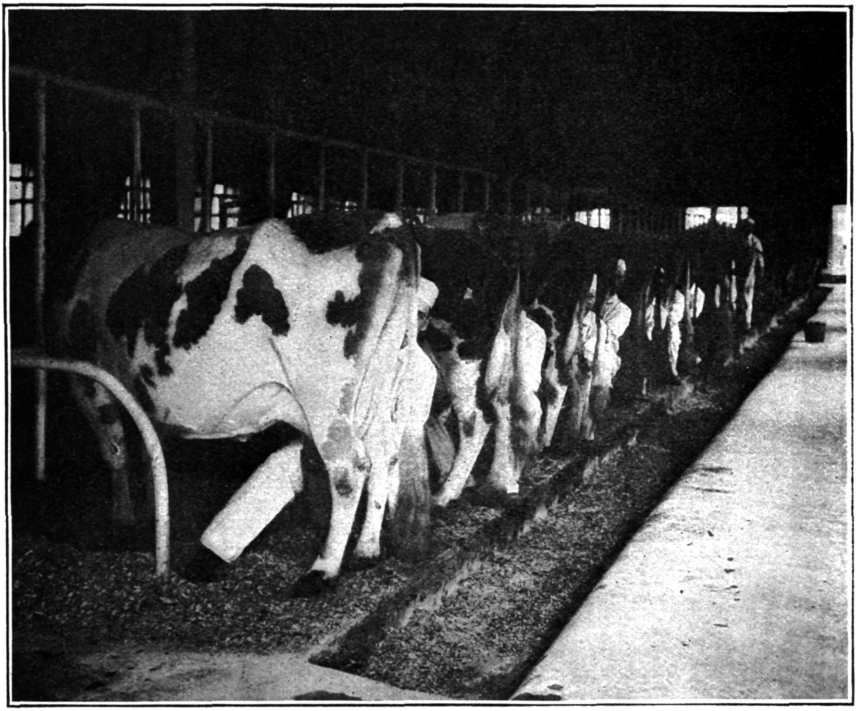


FIG. 26.—Milking cows under clean conditions.

These inspectors should be skilled in all subjects pertaining to the production and distribution of milk. Half of the inspectors should be skilled veterinarians, and the other half should have had training in a good dairy school or have had experience which would be the equivalent of such training.

Inspectors should devote their entire time to the work of inspection and should not be allowed to do outside work that in any way relates

to the business of inspection. There should be a chief inspector to supervise the work, and he should be responsible to the health officer. The health officer, or board of health, should have full power to make rules and regulations and enforce the same so as to safeguard the health of the community from a contaminated milk supply through either carelessness, ignorance, or malicious intent.

THE SCORE-CARD SYSTEM.

For the past two years the Dairy Division of the Bureau of Animal Industry has been making a thorough investigation of the city milk

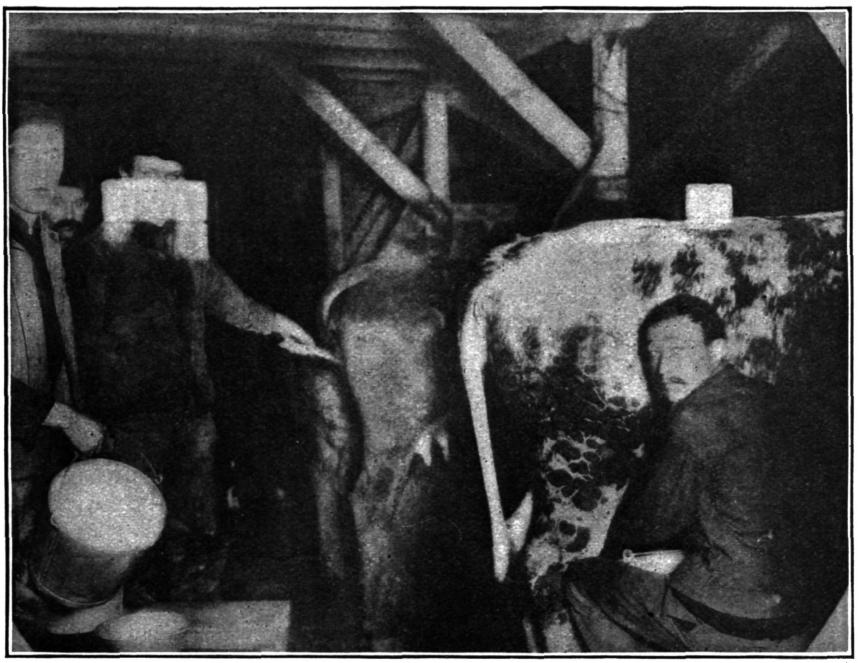


FIG. 27.—Milking cows under filthy conditions with unavoidable contamination of milk.

supply of a large number of cities of the country with a view to establishing a system of inspection and reporting on dairies that would be complete, comprehensive, and meet the needs of the public in the improvement of the milk supply. Dr. W. C. Woodward, health officer of the District of Columbia, was the first to introduce a score-card system of reporting on dairies. A little later Prof. R. A. Pearson, of Cornell University, introduced a card for the same purpose. The cards had many good features, and if they had been generally adopted would have done much to improve the dairy conditions of the country.

The Department of Agriculture took up the work with the hope of extending the use of the score card and thereby promoting more thorough inspection. After three years' work, scoring several thousand dairies in all parts of the country, a score card has been adopted in a more or less modified form and has been introduced and used in about 60 of the larger cities of the country and in many smaller ones. The following is the form of the present card for farm dairies:

[United States Department of Agriculture, Bureau of Animal Industry, Dairy Division.]

SANITARY INSPECTION OF DAIRIES.

DAIRY SCORE CARD.

Owner or lessee of farm_____

Town_____ State_____

Total number of cows_____ Number milking_____

Quarts of milk produced daily_____ Product is sold at wholesale retail. Name and address of dealer to whom shipped

_____

Permit No. _____ Date of inspection_____, 190___

Remarks _____

_____

_____

(Signed)_____

Inspector.

[Back of card.]

DETAILED SCORE.

Equipment.	Score. Perfect.	Allowed.	Methods.	Score. Perfect.	Allowed.
COWS.			COWS.		
Condition	4		Cleanliness	10	
Health (outward appearance)	6		STABLE.		
Comfort	4		Cleanliness	12	
Bedding 2			Floor 4		
Temperature of stable 1			Walls 2		
Protected yard 1			Ceiling 2		
Cubic feet of space per cow: Over 300, 2; over 400, 4; 500 to 1,000, 6	6		Ledges 1		
Feed	4		Mangers and partitions 1		
Water	8		Windows 1		
Clean 6			No other animals in stable 1		
Fresh 2			Stable air	4	
STABLE.			Removal of manure	4	
Location	6		To field or proper pit 4		
Well drained 3			30 feet from stable 2		
Free from contaminating surroundings 3			Cleanliness of stable yard	2	
Construction	10		MILK ROOM.		
Tight, sound floor 3			Cleanliness	6	
Gutter 1			Care and cleanliness of utensils	10	
Stall, stanchion, tie 1			Inverted in pure air 2		
Low-down manger 1			Clean (superficially) 4		
Smooth, tight walls 1			Sterilized 4		
Smooth, tight ceiling 2			MILKING.		
Box stall 1			Cleanliness	14	
Light: 1 sq. ft. glass per cow, 2; 2 sq. ft., 4; 3 sq. ft., 6; 4 sq. ft., 8; even distribution, 2	10		Clean, dry hands 4		
Ventilation: Sliding windows, 2; hinged at bottom, 4; King system or muslin curtain, 8	8		Udders washed and dried 10		
Stable yard (drainage)	2		Cleaned with moist cloth 8		
MILK ROOM.			Cleaned with dry cloth 4		
Location	6		CARE OF MILK.		
Convenience 2			Cooling	20	
Free from contaminating surroundings 4			Removed from stable immediately after milking each cow and promptly cooled 10		
Construction	4		Cooled to 50° F. or below 10		
Floor 1.5			51° to 55° F 8		
Walls and ceilings 1			56° to 60° F 6		
Light .5			Storing	8	
Ventilation .5			Below 50° F 8		
Screens .5			51° to 55° F 6		
Arrangement	2		56° to 60° F 4		
Equipment	6		Transportation	10	
Hot water or steam 2			Iced in summer 10		
Cooler 2			Jacket or wet blanket in summer 8		
Narrow-top milk pail 1			Dry blanket 4		
Other utensils 1			Covered wagon 2		
Water supply for utensils	10				
Clean 6					
Convenient 2					
Abundant 2					
Milking suits	4				
Total	100		Total	100	

Score of methods_____multiplied by 2 = _____

Score of equipment____multiplied by 1 = _____

Total_____ _____divided by 3=_____final score.

NOTE.—Deductions may be made for exceptionally bad conditions.

NOTE.—If the herd has not been tuberculin tested within a year, the limit for the score will be 80.

The use of these cards enables a more perfect study of conditions to be made in any city. The results so reported are comparable and can be analyzed with greater ease and accuracy.

Perhaps not the least valuable part of the score-card system is the demand it makes for better and more competent inspectors. It has usually resulted in the dissatisfaction of inspectors with their previous work. The study of the premises in detail with the view to fixing the exact value of conditions requires better and more conscientious work. Wherever the system has failed—and but one or two such instances are known—this has been because the inspector did not relish the comparison of the results with his previous work.

A striking example of the improvement brought about by the score-card inspection system is given in the work of the Richmond, Va., board of health, as follows:

Table showing percentage of dairy farms in various classes during the first twelve months of dairy inspection at Richmond, Va., May 1, 1907, to May 1, 1908.

Class.	Percentage of all dairies inspected for the month which fell in each class.											
	1907.								1908.			
	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
Scoring below 30	13.8	26.5	3.9	4.0	.....	.....	.....	.....	.....	.....	.....	.....
Scoring between 30 and 40	30.8	42.9	21.0	10.7	.....	.....	.....	.....	.....	.....	.....	.....
Scoring between 40 and 50	26.2	22.4	38.2	29.4	40.0	23.7	14.8	15.8	2.8	.....	.....	.....
Scoring between 50 and 60	13.8	8.2	22.4	33.3	45.0	35.6	45.9	36.8	11.3	13.6	6.8	5.7
Scoring between 60 and 70	10.8	.....	13.2	22.6	12.5	33.9	29.5	23.6	35.2	44.1	39.8	34.3
Scoring between 70 and 80	4.6	.....	1.3	.....	2.5	6.8	8.2	18.4	31.0	25.4	34.2	42.9
Scoring between 80 and 90	.....	.....	.....	.....	.....	.....	1.6	5.4	19.7	16.9	19.2	17.1
Average of all scores for month	41.5	36.4	47.5	50.5	51.4	57.0	58.4	60.5	70.4	69.6	71.5	72.0

The average increase in scores, as shown by the foregoing table, is 30.5 points, or 71 per cent.

FEATURES OF INSPECTION.

The routine of inspection should include (1) health of attendants, (2) health of the herd, (3) purity of the water supply, (4) methods of the dairyman, (5) facilities for producing pure milk, and (6) handling and transportation from farm to city.

These will be discussed briefly in the order given.

HEALTH OF ATTENDANTS.

Dr. John W. Trask, passed assistant surgeon in the United States Public Health and Marine-Hospital Service, says:[a]

During the last fifty years there has been piling up a mass of evidence which would seem to show that milk may receive from man the specific organisms of

[a] Bulletin 41, Hygienic Laboratory, United States Public Health and Marine-Hospital Service.

certain infectious diseases, and that these organisms may retain their virulence for some time and produce the disease in susceptible individuals drinking raw milk.

He lists over 500 epidemics which have been traced directly to milk as the medium through which they were spread. The distribution of milk from sources of such contamination is now absolutely prohibited by law in most cities, and yet in what city is the inspection so complete as to insure beyond any question of doubt that every milk producer obeys the law?

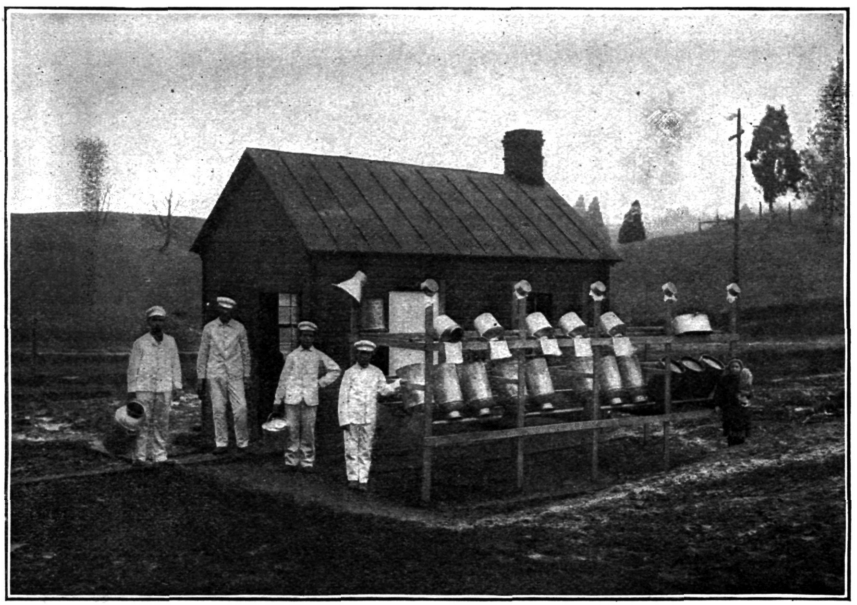


FIG. 28.—An inexpensive but clean dairy house. Milkers in clean white suits; pails and cans handled in a sanitary manner.

HEALTH OF THE HERD.

The health authorities and the consuming public are just beginning to awaken to the dangers of contamination of the milk supply through diseased cattle. It is unfortunate that the desire for the immediate dollar is in many dairymen greater than their desire to produce and distribute a pure and wholesome milk, though such milk will certainly in the end bring a greater profit. They attempt to hide any fact of sickness in their herds, at the expense of the health of the public. Dr. John R. Mohler, of the Bureau of Animal Industry, in the following recommendations to the Commissioners of the District of Columbia, points out what should be done in this connection:

Milk from cattle showing udder infection or anthrax, rabies, gastro-enteritis, septic conditions, or clinical symptoms of tuberculosis, shall not be utilized as human food, even though the milk be pasteurized.

All milk produced on dairy farms shall come from either tuberculin-tested cattle, which shall be retested at least once a year, or be subjected to pasteurization under the supervision of the health department in case the herd is not tuberculin tested.

PURITY OF WATER SUPPLY.

Even greater than the lack of interest in the health of the cows has been the lack of proper appreciation of the part that a polluted water supply on dairy farms may play in the health of the community. Yet in the great majority of cases trouble of this kind can be very readily overcome. As a result of a survey of 290 dairy

FIG. 29.—An undesirable dairy house. Cans exposed to contamination.

farms in Maryland and Virginia by the Bureau of Animal Industry, Dr. B. M. Bolton sums up this question as follows:

The results seem to show that there are comparatively few water supplies which are free from sanitary objections; but in spite of this fact it is nevertheless probable that in many cases the faults can be rectified. In fact, the faults have already been corrected in some cases where they were pointed out to the owners of the dairies. It would seem advisable in some cases to close up the source of supply, but in most cases all that would be necessary is to point out to the dairymen the sources of pollution and to give them instruction in regard to their avoidance.

To follow out these suggestions means the employment of inspectors competent to pass on the conditions of the water supply. There are too many inspectors employed who can not intelligently do this.

METHODS OF DAIRYMEN.

The weakest point in the inspection system as ordinarily practiced is the inability of the inspector in most cases to be present at milking time. A dairyman's methods should be given at least twice as much weight as the ordinary facilities and utensils with which he works, and the methods to be criticised can be seen at their best or their worst only while the operation of milking is going on. It is the practice of the Dairy Division to score methods separately from equipment, and invariably the score is lower if the inspector sees the milking done than if he has to fill out this part of the card by questioning the owner or his helpers.

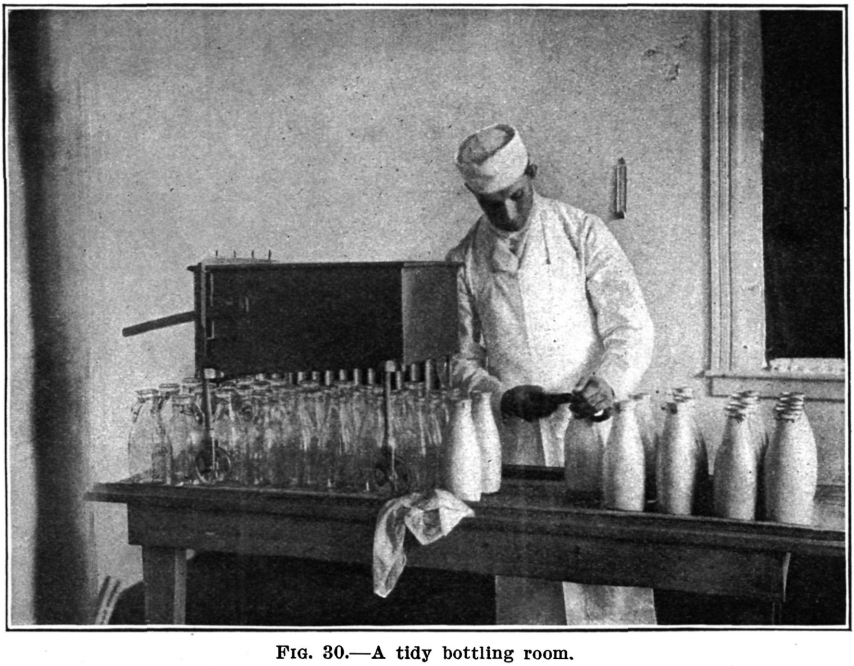


FIG. 30.—A tidy bottling room.

If a man has an inborn capacity or instinct to be clean, a little instruction will enable him to do satisfactory work; but if he is lacking in this quality it is very difficult to change his methods by any amount of instruction or police regulation. The contamination that enters milk because of this lack of the sense of common cleanliness is most serious. This disposition toward uncleanliness is responsible for such practices as milking with filthy clothing and hands, filthy udders and flanks, wetting the hands with milk during milking, straining and aerating the milk in the stable, storing and shipping milk in cans that have not been properly washed and ster-

ilized, and many little practices which seem very small and of little importance in themselves, but add, each, their quota to the contamination of milk.

FACILITIES FOR PRODUCING PURE MILK.

The tools with which a man works can only to certain extent determine the fineness of his results. Good results are often obtained with poor tools. Yet the same results might be obtained much more readily if the tools were of the proper kind and fitted for the work.

Barns, stalls, floors, utensils, milk houses, conveniences in conveying and heating water, and all other accessories of the dairy may be

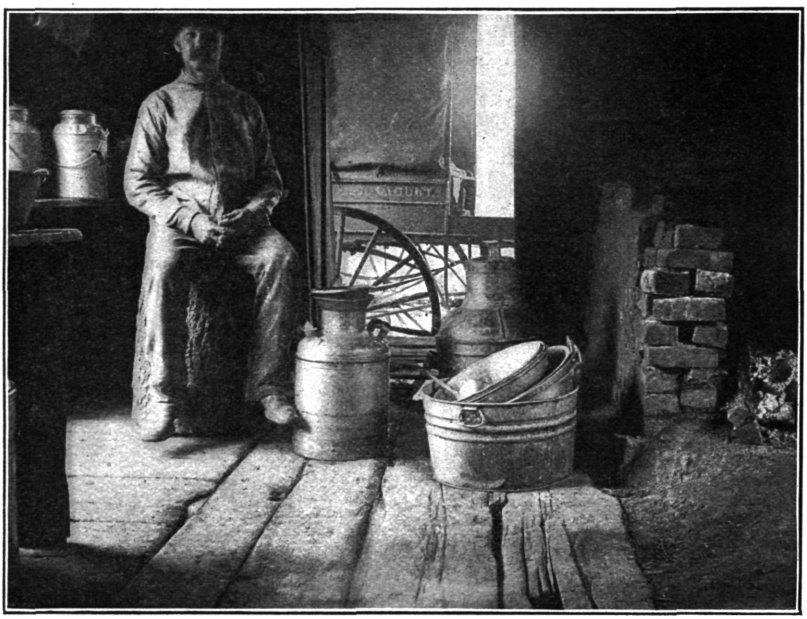


FIG. 31.—A bad place for handling milk.

so constructed and arranged that they require a great amount of labor to produce the desired results, or they may all be so contrived that the labor is easy and the results much more certain. While the mere matter of convenience is one mainly for the dairyman, the authorities should at least require adequate and sanitary equipment and facilities for the production of wholesome milk.

HANDLING AND TRANSPORTING MILK FROM FARM TO CITY.

The same element of doubt as to whether any inspection system can insure perfect work exists here as in the other processes under consideration, though perhaps to a lesser degree; yet there is the pos-

sibility that the milk will be exposed to unfavorable temperatures, delayed in transit, handled carelessly by employees, and delivered in a condition that renders it unfit for consumption as raw milk. These matters should, of course, be guarded against so far as possible by inspection.

THE CLASSIFICATION OF MILK.

It may be impossible for a farmer to meet the ideal conditions. Shall he, then, be compelled to discontinue his dairy? A city can not do without milk, and too rigid requirements of the ideal might easily cause a milk famine.

There are farmers who have the knowledge and the business ability to produce an article so superior that it may be sold as certified milk. Others are also careful in their work, and are so situated that they can produce a high class of milk free from any suspicion of disease organisms, but can not afford the expense attached to the production of certified milk. Each of these classes finds patrons willing to pay the extra cost of such production. As the consuming public becomes more enlightened on the subject, the demand for such milk will increase, as it should.

These classes of milk, however, are but a fraction of 1 per cent of the total milk demanded by a city. The vast proportion of producers are so situated, because of natural environment, personal handicap, or distance that they can not produce a milk which will meet the requirements of an ideal standard. To cut them off would deprive the city almost wholly of milk. This is the condition; what is the remedy? Dr. A. D. Melvin, Chief of the Bureau of Animal Industry, has proposed a system of classifying milk as follows: (1) Certified milk, (2) inspected milk, (3) pasteurized milk. Under this plan all milk of doubtful quality and not meeting the requirements of the first two classes would be rendered measurably safe by pasteurization under official supervision, and no milk not coming within one of the three classes would be allowed to be sold.[a]

PASTEURIZATION.

Let it be clearly understood that pasteurization is not recommended as a cure for all the ills of the milk business. No amount of pasteurization will make bad milk good. By destroying disease germs, however, pasteurization will render practically safe milk which would otherwise be dangerous to health; but the quality of the milk, as such, is not improved; rather the reverse is true.

[a] The classification of milk is treated in a separate article by Doctor Melvin on page 179 of this volume.

Even with an efficient inspection system, as outlined above, it will not be possible for some time to obtain a sufficient supply of wholesome raw milk, and for this reason pasteurization is recommended as a temporary makeshift for dealing with milk of doubtful quality.

Pasteurization will not take the place of a careful and adequate inspection system. Such inspection system should eventually obviate the necessity for pasteurization, but this can not be accomplished until the consumer is willing to pay the increased cost of pure milk, nor until the producer works on a higher plane than the average do at present.

THE CLASSIFICATION OF MILK.

By A. D. MELVIN, D. V. S.,
Chief of the Bureau of Animal Industry.

In the spring of 1907 a conference was appointed by the Commissioners of the District of Columbia to consider and report upon the local milk supply, to advise what steps should be taken to improve it, and to suggest legislation to that end. The writer, as a member of that conference and as a member of a subcommittee to consider sanitary aspects of the milk supply, was asked to present a system for the classification of milk for the purposes in view. A classification substantially as hereinafter set forth was accordingly presented by him to the subcommittee and by the latter to the conference, and was recommended by that body for adoption. The system is believed to be equally applicable, with possibly some slight modification, in other cities as well as Washington. It should be understood that the provision for pasteurization is not ideal and should only be continued until a normal quantity of wholesome raw milk can be provided by dealers.

OBJECTS OF CLASSIFICATION.

In providing for the classification of milk the primary object is to exclude all milk which may be harmful to the consumer and to provide for milk that will be wholesome and nutritious. In doing so the restrictions should not be more burdensome than is necessary to accomplish this result, and should not be so severe as to lessen materially the quantity and so eliminate milk, on account of increased price, as an article of diet for the poor. In view of the danger of using raw milk from diseased cows, drawn in improperly constructed dairies and under insanitary conditions, and improperly handled, it is imperative that no raw milk be sold to the public except when those in authority know that it is safe to be used in that condition.

Raw milk of the highest standard should be produced for the use of infants and invalids and for those who desire to use only such milk and who are willing to pay for the greater cost of production. A wholesome supply of raw milk which can be furnished without involving unreasonable cost should also be provided for others. A third class includes undoubtedly the largest proportion of milk which is at the present time furnished for consumption and is unsafe for

consumption in the raw state. To remove immediately from consumption this latter supply would result in such an increase in the cost of all milk as to place milk as an article of diet beyond the reach of the poor. It seems necessary, therefore, to provide some means of rendering safe all milk of doubtful quality, and this can be done under present conditions only by pasteurization under proper supervision.

The tuberculin test when applied by the Bureau of Animal Industry to several hundred of the cows supplying milk to the city of Washington showed that about 17 per cent of those tested were affected with tuberculosis, and it is believed that just as high a proportion of diseased cows will be found in the dairy herds supplying many other cities. These cows should be replaced by healthy ones. The work of testing with tuberculin all cows supplying milk to a city of considerable size is an immense undertaking and must necessarily consume much time. Much time is required also in providing suitable cow stables, milk houses, and a pure water supply in all instances where such essential features are lacking. Facilities must also be provided for delivering milk at a reasonable temperature.

It has been demonstrated that cows showing no physical evidences of tuberculosis may be affected with tuberculosis and secrete milk containing germs of that disease; also that the feces of such cattle are contaminated with that bacillus, and particles of such feces can readily gain entrance into milk. It seems important, therefore, in any classification of milk for city use, to require pasteurization of all doubtful milk for some time, or until all doubt as to the wholesomeness of the milk is removed.

It is therefore recommended that milk be graded in three classes, (1) certified milk, (2) inspected milk, and (3) pasteurized milk, in accordance with the specifications following, and that this classification be embodied in laws and regulations and enforced by public health authorities.

CLASS 1. CERTIFIED MILK.

The use of this term should be limited to milk produced at dairies subjected to periodic inspection and the products of which are subjected to frequent analyses. The cows producing such milk must be properly fed and watered, free from tuberculosis, as shown by the tuberculin test and physical examination by a qualified veterinarian, and from all other communicable diseases, and from all diseases and conditions whatsoever likely to deteriorate the milk. They must be housed in clean, properly ventilated stables of sanitary construction, and must be kept clean. All persons who come in contact with the milk must exercise scrupulous cleanliness and must not harbor the germs of typhoid fever, tuberculosis, diphtheria, or other infections

liable to be conveyed by the milk. Milk must be drawn under all precautions necessary to avoid infection, and be immediately strained and cooled, packed in sterilized bottles, and kept at a temperature not exceeding 50° F. until delivered to the consumer. Pure water, as determined by chemical and bacteriological examination, is to be provided for use throughout the dairy farm and dairy. Certified milk should not contain more than 10,000 bacteria per cubic centimeter, and should not be more than twelve hours old when delivered. Such milk should be certified by public health officers or by some other properly constituted authority.

CLASS 2. INSPECTED MILK.

This term should be limited to clean raw milk from healthy cows, as determined by the tuberculin test and physical examination by a qualified veterinarian. The cows are to be fed, watered, housed, and milked under good conditions, but not necessarily equal to the conditions prescribed for class 1. All persons who come in contact with the milk must exercise scrupulous cleanliness and must not harbor the germs of typhoid fever, tuberculosis, diphtheria, or other infections liable to be conveyed by the milk. This milk is to be delivered in sterilized containers and is to be kept at a temperature not exceeding 50° F. until it reaches the consumer. It should contain not more than 100,000 bacteria per cubic centimeter.

CLASS 3. PASTEURIZED MILK.

Milk from dairies not able to comply with the requirements specified for classes 1 and 2 should be pasteurized before being sold, and should be sold under the designation "pasteurized milk." Milk for pasteurization should be kept at all times at a temperature not exceeding 60° F. while in transit from the dairy farm to the pasteurizing plant, and milk after pasteurization should be placed in sterilized containers and delivered to the consumer at a temperature not exceeding 50° F.

All milk of unknown origin should be placed in class 3 and subjected to clarification and pasteurization. No cow in any way unfit for the production of milk for use by man, as determined upon physical examination by an authorized veterinarian, and no cow suffering from a communicable disease should be permitted to remain on any dairy farm on which milk of class 3 is produced, except that cows which upon physical examination do not show physical signs of tuberculosis may be included in dairy herds supplying milk of this class.

This milk is to be clarified and pasteurized at central pasteurizing plants, which should be under the personal supervision of an officer or

officers of the health department. These pasteurizing plants may be provided either by private enterprise or by the municipality, and should be located within the city.

By the term " pasteurization " as used herein is meant the heating of milk to a temperature of 150° F. or 65° C. for twenty minutes, or 160° F. or 70° C. for ten minutes, as soon as practicable after milking, in inclosed vessels, preferably the final containers, and after such heating immediate cooling to a temperature not exceeding 50° F. or 10° C.

OTHER CONDITIONS.

No milk should be regarded as pure and wholesome which, after standing for two hours or less, reveals a visible sediment at the bottom of the bottle.

No dairy farm should be permitted to supply milk of a higher class than that for which its permit has been issued, and each dairy farm supplying milk of a specified class should be separate and distinct from any dairy farm of a different class. The same owner, however, may supply different classes of milk, providing the dairy farms are separate and distinct.

The term " milk " as herein used includes cream.

MILK AND ITS PRODUCTS AS CARRIERS OF TUBERCULOSIS INFECTION.[a]

By E. C. SCHROEDER, M. D. V.,
Superintendent of Bureau Experiment Station.

In this paper the endeavor will be made to show (1) that tubercle bacilli are frequently present in milk delivered by dairymen to their city customers; (2) that the manner in which tubercle bacilli are eliminated from the bodies of tuberculous cattle offers strong reasons to suspect that they will contaminate milk obtained not only from tuberculous cows but also from healthy cows stabled and milked in a tuberculous environment; (3) that the presence of tubercle bacilli in milk certainly insures their presence in cream, ice cream, butter, and cheese made from it, and (4) that we have no satisfactory reasons for assuming that tubercle bacilli in milk and other dairy products are harmless for human beings.

THE OCCURRENCE OF TUBERCLE BACILLI IN MARKET MILK.

Without reviewing the numerous investigations of older date, or those made in foreign countries, three investigations recently made at Washington, D. C., will amply illustrate the infected condition found when milk, such as is distributed by dairymen in the larger eastern cities of the United States, is examined for the presence of living, virulent tubercle bacilli.

The three investigations were made almost simultaneously, but were quite independent of each other. The first dealt with 223 samples of milk, among which 15, or 6.7 per cent, contained each a sufficient number of tubercle bacilli to cause fatal tuberculosis on the inoculation of guinea pigs. The 15 infected samples were derived from 11 dairies, or 10.7 per cent of the 102 from which milk was tested.[1] [b] The second investigation dealt with 73 samples of milk, among which 2, or 2.7 per cent, contained virulent tubercle bacilli.[22] The number of dairies from which this milk was obtained is not given. In the third investigation (now in progress at this station and the results of which have not heretofore been published) 36

[a] This paper was presented at a meeting of the New York Milk Committee, New York, N. Y., April 11, 1908.

[b] The superior figures in the text relate to the references to literature at end of article.

samples of milk have been examined, among which 2, or 5.5 per cent, contained virulent tubercle bacilli. The two infected samples were obtained from two dairies, or 7.7 per cent of the 26 from which milk was tested.

The total number of milk samples included in the three investigations was 332, and among them 1 in every 18 contained virulent tubercle bacilli in such numbers that their presence could be clearly demonstrated. The known number of dairies from which milk was purchased under conditions which implied that it was intended for use as human food, and tested, was 128, and among them it was definitely proven that 1 in less than every 10 was distributing virulent tubercle bacilli in a way that did not leave to chance their entrance into human bodies.

The first and largest of the three investigations supplies additional data that merit attention. As we have seen, 15 samples of milk among 223 contained virulent tubercle bacilli, and the 15 samples were derived from 11 dairies out of 102. Now, the 11 infected dairies, in addition to supplying 15 samples of infected milk, also supplied 14 samples that were not infected, and no dairy was the source of more than 1 sample on the same day.

It is apparent from this that infected dairies distribute tubercle bacilli intermittently and not continuously, and hence, while the Washington milk investigations may give an approximate idea of the frequency with which tuberculous milk is sold, they do not give an adequate idea of the frequency with which dairies are infected, and this is equivalent to saying that the investigations do not show, though they indicate, how extensive or widespread is the distribution of tuberculous milk.

We may reason as follows: Since the examination of 29 samples of milk from dairies proven to be tuberculous showed 15 samples infected and 14 free from infection, the probability that the tuberculous character of a dairy will be discovered by the examination of 1 sample of milk from it is as 15 to 29. In other words, the chance that the infected character of a dairy will be revealed by the examination of 1 sample of milk from it is practically no greater than the chance that it will remain concealed.

Two of the Washington milk investigations give the number of dairies from which milk was tested and the number of samples tested from each dairy, and hence it can be said that only one sample each was tested from 52 of the total 128 dairies from which milk was obtained. Among the 52 samples, each from a different source, 48 were shown to be free from and only 4 to contain tubercle bacilli. If the foregoing reasoning is sound and we apply it here, it is fair to conclude that the number 4 must be multiplied by 2 to give us the

actual number of infected dairies among the 52, and this would raise the charge against Washington dairies from 1 infected dairy among 10 to 1 infected dairy among 7½.

That this manner of reasoning may justly be applied to gain a true idea of the proportion of dairies that distribute milk infected with tubercle bacilli is well illustrated by the following experiment:

In September, 1907, a sample of tuberculous milk was obtained from a city dairy; it caused generalized tuberculosis in two guinea pigs inoculated with it. Several months later 10 samples of milk were taken from this same dairy, each on a different day, and tested by guinea-pig inoculation specifically to determine the frequency with which individual infected dairies distribute tuberculous milk. The samples of the second, third, and eighth days were found to contain tubercle bacilli, and the samples of the remaining seven days were found to be free from them. Apparently it is safe to drink the raw milk from this dairy seven days out of ten, but it is a little uncertain on which three days it is safer to boil it.

I do not wish to create an exaggerated idea of the number of dairies that intermittently distribute tubercle bacilli in milk. The actual conditions are so serious that without exaggeration they are almost beyond belief. The reasoning of which I have given a sample could be continued by using the fact that the Washington milk investigations show in several instances that three samples of milk from one infected source were examined before evidence was obtained to prove the infected character of the source in question.

The test of milk for the presence of tubercle bacilli is made in two ways—microscopic examination and inoculation of animals. Microscopic examination does not reveal the presence of tubercle bacilli unless they are quite numerous. The inoculation test is more delicate, but the quantity of milk used is very small—from $\frac{1}{500}$ to $\frac{1}{100}$ of a pint—and if this can demonstrate, by causing fatal tuberculosis in an experiment animal, that a dairy is distributing infected milk, the probability is that tubercle bacilli are present in quarts and gallons of the infected milk in dangerous abundance.

The tubercle bacilli that milk contains are a source of great danger to the consumer, irrespective of whether he swallows them daily, every other day, or only once or twice weekly.

THE PROPORTION OF DAIRY COWS INFECTED.

The seriously infected condition of Washington milk shown by the Washington investigations must not be regarded as exceptional. Tubercle bacilli in milk are derived with comparatively few exceptions from tuberculous cows. If the available figures for estimating the proportion of tuberculous cows among those from which Washington

and New York, respectively, obtain milk are worth anything, the latter city truly has more reasons for uneasiness than the former. Among 1,538 cows in 104 dairy herds supplying milk to Washington, D. C., the tuberculin test revealed 16.9 per cent affected with tuberculosis [22], while the tuberculin test applied to 12,721 cows in 683 herds in 50 counties of New York State showed that little less than one-third of the cows were affected with tuberculosis and that the tuberculous cows were distributed in about two-thirds of the herds.[26] Good reasons can be given for assuming that the percentage for Washington dairy cattle is too low, and relative to the figures for New York, it is well to remember, as Professor Moore, of Cornell, pointed out, that the cows actually tested constitute only about one-half of 1 per cent of the total number in the State—not a sufficient proportion for general deductions. But we will not go astray if we assume that New York milk is at least as badly infected with tubercle bacilli as that of Washington.

SUMMARY OF THE TUBERCULOUS CONDITIONS FOUND IN MARKET MILK.

Before passing on to other matters it may be well to draw some conclusions relative to the tuberculous conditions found in market milk, as shown from the preceding facts.

1. It has been shown that milk delivered by dairymen to their city customers is frequently infected with living, virulent tubercle bacilli. There is nothing hypothetical, circumstantial, or inferential about this; it is a fact, a plain, experimentally demonstrated fact.

2. The frequency with which regular commercial or market milk contains living, virulent tubercle bacilli is so great that no one who uses raw milk extensively, or as a beverage, can reasonably hope to escape introducing many tubercle bacilli into his body.

3. Dairies that distribute tubercle bacilli in milk as a rule do so intermittently; hence the test of one sample or several samples of milk from one source may give negative results as to the presence of tubercle bacilli without proving the source in question safe.

4. Though the test of a large number of milk samples may give an adequate idea of the proportion of milk that contains tubercle bacilli, it does not provide the necessary material for a satisfactory conclusion as to the proportion of dairies that distribute tuberculous milk. Taken as a whole, the evidence we have indicates that the proportion of infected dairies is at least twice, probably three times, and possibly four, five, or six times as great as the proportion of infected milk.

5. We should give careful attention to both the percentage of infected milk and the percentage of infected dairies. The former indicates more precisely the frequency and intensity with which indi-

vidual persons are exposed to tubercle bacilli in milk and dairy products, while the latter supplies a better idea of the total number of individuals who are exposed.

HOW TUBERCLE BACILLI ARE ELIMINATED FROM THE BODIES OF TUBERCULOUS CATTLE.

The manner in which tubercle bacilli are expelled from the bodies of tuberculous cows is a subject that has received considerable attention at the Experiment Station of the Bureau of Animal Industry during the last three years.[42] [41] [37] The danger from tuberculous persons depends almost entirely on material expelled from their mouths, either as sputum or as an infectious spray of minute droplets. An infectious spray of droplets is also expelled from the mouths of cows during coughing. But cows differ from most persons in one important respect relative to the expulsion of tubercle bacilli. They do not spit; they swallow their sputum, and the tubercle bacilli it contains pass through their bodies and out per rectum with their feces. What this means for the introduction of tubercle bacilli into milk can readily be comprehended when we know that among 172 samples of milk examined last year by the United States Public Health and Marine-Hospital Service 121, or over 70 per cent, contained a visible sediment after standing several hours in the original containers, and that the sediment was composed largely of cow feces.[33]

During the last five or six months I have personally examined the sediment in 66 specimens of milk obtained from the general city supply, and found that even the purest contained a trace of partly digested vegetable matter, probably from the bowels of a cow, while the dirtiest contained about one-fourth of 1 per cent of cow feces. Between the cleanest and the dirtiest there was a regular gradation in the quantity of cow dung present. A sample of milk entirely free from fecal contamination seems to be a rare exception to the general rule. This may not sound very nice, but it has one virtue—it is true.

TUBERCLE BACILLI IN COWS' FECES.

Cows that pass tubercle bacilli from their bowels are not, as might be supposed, well-marked, advanced cases of tuberculosis. I believe most dairymen are too conscientious to sell milk from cows that appear to be sick. Among 12 apparently healthy cows known to be tuberculous only because they had been tested with tuberculin, microscopic examination revealed that 5, or 41 per cent, were passing feces infected with tubercle bacilli. These cows were especially selected from dairy herds for use in an experiment in which a number of recently affected, seemingly healthy, tuberculous cattle were required, and not one among them showed a symptom or a sign of tuberculosis

or other disease that a dairyman or veterinarian could have detected without the tuberculin test. Among 13 cows, of which it was known that they had been affected with tuberculosis eighteen months or more, the microscopic examination of feces revealed that 11, or 84.6 per cent, were passing tubercle bacilli per rectum. These cows, judged from their general appearance, were in much better condition than the cows in many dairy herds; they certainly did not look like sick animals. Among a small lot of well-preserved tuberculous cows that were known to have been affected with tuberculosis three years or more, every one was found to be passing tubercle bacilli per rectum.

To judge from an editorial in the New York Medical Record of March 21, 1908, on the investigations published by R. Rosenberger in the American Journal of Medical Sciences for December, 1907, the occurrence of tubercle bacilli in the feces of tuberculous persons also is so common that their presence may serve to establish an otherwise doubtful diagnosis of tuberculosis.

The infectious, virulent character of tubercle bacilli in the feces of tuberculous cows was proven in several ways, as follows:[42] [41] [37] (1) By causing tuberculosis in guinea pigs as a result of inoculation with feces; (2) by causing tuberculosis in guinea pigs as a result of inoculation with milk from healthy cows soiled with small quantities of feces; (3) by causing tuberculosis in guinea pigs by inoculating them with butter made from normal milk slightly soiled with feces; (4) by causing tuberculosis among hogs by allowing them access to feces; and (5) by isolating pure cultures of tubercle bacilli from guinea pigs that contracted tuberculosis as the result of inoculation with feces, and causing tuberculosis in cows by inoculating them with these cultures. In one instance the inoculation of a cow with a pure culture of tubercle bacilli, obtained in the manner described, caused an extremely acute form of tuberculosis which ended in death in a few months.

The passage of tubercle bacilli through the body of a cow without loss of virulence was demonstrated by feeding a cow small doses of tubercle bacilli in drinking water and recovering them from her feces. The head of the cow was walled away from her body by a solid board partition and the general conditions were such that nothing could pass behind her from her head without passing through her body. Tubercle bacilli were found not only in the feces, but also in scrapings taken from the rectal mucosa of the cow. The bacilli used in this experiment were of a grade of virulence too low to cause tuberculosis in bovine animals.

The ease with which feces of cows are splashed, sprayed, and otherwise introduced into milk needs no argument, as it has been shown that most of the milk that reaches the consumer is to some extent contaminated with feces. If a single cow in a dairy herd is affected

with tuberculosis it is just as likely to be her feces as those of any other cow which get into the milk; hence the presence of a single tuberculous cow, after she has reached the stage when tubercle bacilli are being eliminated by the way of her bowels, establishes an environment in which milk may become infected with tubercle bacilli. A cow passes about 30 pounds of moist feces each day, and all parts of this may be so infected that tubercle bacilli can be detected in any part on microscopic examination.[41] This is a large amount of infected material to have near the source from which an important article of human food is obtained that is used mostly in a raw state.

UDDER TUBERCULOSIS.

The occurrence of udder tuberculosis among cows is comparatively rare, though it has been estimated that 2 per cent of all tuberculous cows have tuberculous udders.[27] When it does occur the milk will be heavily infected. The possibility of tubercle bacilli passing through the healthy udder of a tuberculous cow when milked is an unsettled question, but if the results obtained from an experiment reported by Doctor Griffith in the appendix of the Second Interim Report of the British Royal Commission on Tuberculosis are reliable this is not only possible, but is of much commoner occurrence than we previously had reason to suspect.[17]

The various facts presented in this short review of the manner in which tubercle bacilli are expelled from the bodies of tuberculous cows give us valid reasons to conclude that it is impossible to obtain milk certainly free from tubercle bacilli, either from tuberculous cows or from healthy cows in a tuberculous environment. The milk of the former may become infected with bacilli eliminated through the udder, and the milk of both the former and the latter may become infected with tubercle bacilli that leave the bodies of tuberculous cattle at both ends—in the feces and in particles of fluid sprayed from their mouths.

THE OCCURRENCE OF TUBERCLE BACILLI IN CREAM, ICE CREAM, BUTTER, AND CHEESE.

On standing or by passage through a centrifuge milk separates into three distinct layers—cream, skim milk, and sediment. The character, appearance, and relative quantity of cream and skim milk are too well known to require description. The small sediment in pure, fresh, normal milk commonly escapes observation; it has a chalky, white appearance and on microscopic examination is seen to be composed mainly of leucocytes and a little epithelium. By experiments made at this station a number of years ago and recently repeated it was found that tubercle bacilli, when they are present in

milk, soon disappear from the skim milk and collect in about equal proportion in the cream and the sediment. This is equally true when cream separates slowly and naturally and when it is forced to the surface quickly by the use of a centrifugal machine.

As tubercle bacilli have a higher and cream has a lower specific gravity than milk, it does not seem unreasonable to infer that the bacilli should gravitate away from the cream and leave it free from infection as it rises to the surface of infected milk. This inference, however, is erroneous; it would no doubt be true if cream were a homogeneous substance and not an aggregation of small spheres or globules. The truth is, the minute bacilli adhere to the relatively large cream globules with a tenacity that can not be broken by the existing difference of specific gravity, even when this is augmented by the application of a centrifugal force strong enough to press the cream into a semisolid almost butterlike mass. Hence, when tubercle bacilli are present in milk they will be present in greater concentration in the cream derived from it, and when ice cream is made from such infected cream it will be just as dangerous to eat it as it is to use infected milk as a beverage.

Cream is the substance from which butter is made, and that butter made from infected cream will also be infected was proved by making butter from infected cream and testing it by guinea-pig inoculations. The cream used in the tests was derived in some instances from the milk of a cow affected with udder tuberculosis and in other instances from normal, healthy milk to which small amounts of feces from a tuberculous cow had been added. As the bacilli that reached the butter were in no instance added directly to the cream, the butter tests show in themselves a perfect transition of tubercle bacilli from milk to cream, and from cream to butter.[41]

An investigation is now in progress at this station to determine the frequency with which market or commercial butter contains tubercle bacilli. The work has only gone far enough to show that some of the butter sold by dealers is very badly infected. If we take the figures supplied by European investigators of the relative frequency with which butter and milk contain tubercle bacilli we may conclude that butter is more frequently infected than milk; in fact, we may say that butter contains tubercle bacilli in sufficient number for their detection thirteen times for every ten times they can be found in milk.[19 12 8]

It is a simple matter to destroy tubercle bacilli in milk and cream by pasteurization. Just how to make infected butter safe is a more difficult problem. For those who are opposed to pasteurization it may be well to call attention to the fact that the United States Public Health and Marine-Hospital Service has shown anew that the benefits derived from it immeasurably outweigh the disadvantages attributed to it.[32]

The precise period of time during which tubercle bacilli remain alive in butter is a question for the solution of which the available data are exceedingly contradictory. Cornet, in his voluminous but excellent work on tuberculosis, published in 1907, points out that Laser could find no live bacilli in butter after twelve days; that Heim records that all tubercle bacilli eventually die in butter and that their maximum life in it is thirty days; that Gasperini found a reduction of virulence after thirty days, though the bacilli were still alive after one hundred and twenty days, and that Dawson, in America, did not observe a reduction of virulence until after the passage of three months, and claims to have produced tuberculosis in a guinea pig by inoculating it with butter eight months old.

The two extremes, twelve days and eight months, are too far apart to be satisfactory; either or both may be wrong; both certainly can not be right. A fairly large difference in the results obtained by different investigators may be reconciled on the assumption that they used very different kinds of butter in their tests. Salt has distinct though weak germicidal properties, hence tubercle bacilli in heavily salted butter may live only a short time, while in unsalted butter they may live and remain virulent indefinitely. Broërs,[8] whose work on tuberculous dairy products seems to be especially reliable, found that tubercle bacilli will live three days in milk even when it has undergone changes that make it unfit for use as food, and twelve days in buttermilk, and that they certainly remain virulent three weeks in butter.

The work of the Experiment Station of this Bureau shows conclusively that no appreciable attenuation of tubercle bacilli in ordinary salted butter occurs in forty-nine days; that they are still highly virulent after ninety-nine days even though the butter has become rancid and moldy, and that they are still alive and capable of causing rapidly fatal tuberculosis in guinea pigs after one hundred and thirty-three days. Mohler, who has made a special study of the length of time tubercle bacilli remain alive in butter held in cold storage under ordinary commercial conditions, has shown that one hundred and fifty-three days is not long enough to kill them.[22]

As light and dryness are the two most potent natural agents for the destruction of pathogenic bacteria, there are good reasons for believing that tubercle bacilli can find no better conditions for their preservation than the bland, moist, opaque character of butter offers.

Cheese has also been found to contain tubercle bacilli; in it they may live from thirty to forty days; the kinds most dangerous are consequently those eaten shortly after they are made. Cheeses which ripen slowly probably contain no living tubercle bacilli when they reach the consumer.[22] [18]

The positive facts at hand all point to the conclusion that cream, ice cream, butter, and cheese invariably contain tubercle bacilli when made from tuberculous milk.

In cream and milk the bacilli can probably be made harmless by pasteurization, and in slowly ripened cheeses they are of little importance; but in ice cream and butter, and in cheese which undergoes no prolonged ripening, it is difficult to know how to protect public health against them. In butter the bacilli are particularly dangerous, because of their long retained vitality and virulence, and because butter is, next to milk, the most important and the most commonly used food product derived from animals.

Unfortunately we can draw no consolation from the fact that oleomargarin is much used as a substitute for butter. As Mohler [23] recently pointed out, the fat from which it is made is not subjected to a temperature high enough to kill tubercle bacilli, and hence oleomargarin or artificial butter may become infected in two ways—by fat derived from tuberculous animals or by the butter and sour milk that enter into its composition. Mohler states that Morgenroth examined 20 samples of oleomargarin purchased in open market and found that 9 of them contained virulent tubercle bacilli.

It is clearly desirable that the cream used in making ice cream and butter, and the milk used in the preparation of rapidly cured cheeses and artificial butter, should either be pasteurized or sterilized before use, or should be obtained from cows that are known to be free from tuberculosis and are stabled, pastured, and milked in a healthful environment.

THE INFECTION OF DAIRY PRODUCTS BY TUBERCULOUS PERSONS.

Though most tubercle bacilli in dairy products probably have a bovine origin, it will not do to ignore the fact that some of them may be derived from tuberculous persons. Persons affected with either pulmonary or laryngeal tuberculosis spray tubercle bacilli from their mouths during coughing, sneezing, and talking, enveloped in droplets of phlegm and saliva. The infectious droplets, when they contaminate articles of food that are not subjected to a sterilizing process before they are eaten, may be a source of great danger. Butter, cheese, and ice cream, unless they are used in the preparation of other articles of food, are not cooked after they pass from the dealer to the consumer, and the same is true to a lesser extent of cream and milk; hence these substances, if they are exposed to an infectious spray of droplets from the mouth of a tuberculous individual at any stage during their manufacture or handling, may serve the purpose of dangerous carriers of tuberculous infection from person to person.

Persons known to be tuberculous should be kept away from articles of food, especially articles of food either commonly or occasionally eaten in the condition in which they are obtained from the dealer.

THE SIGNIFICANCE AND VIRULENCE OF TUBERCLE BACILLI IN DAIRY PRODUCTS.

No one doubted the intertransmissibility of human and bovine tuberculosis before Theobald Smith [44 45] published his studies on different varieties of tubercle bacilli and Koch made his famous address against the identity of human and bovine tuberculosis.[21] Since that time investigators have been very active with all phases of the tuberculosis question, and the result is a voluminous and varied, also a cumbersome and frequently contradictory, literature. To discuss thoroughly the evidence for and against the view that tubercle bacilli in milk and dairy products have an important significance for public health would fill a large volume, and hence we can give this important subject but scant attention at the present time.

THE INFECTION OF THE LUNG THROUGH THE STOMACH AND INTESTINES.

Unless tubercle bacilli can enter the body through the uninjured mucosa of the digestive tract and cause disease in regions remote to it without leaving evidences of their passage, we may conclude that they are of little importance in food, irrespective of the source from which they are derived. The truth of this statement is so self-evident that many investigators undertook to prove the permeability of the digestive tract for bacteria generally and the tubercle bacillus specifically, and I do not believe that anyone can read the works published by Desoubry and Porcher,[13] Baumgarten,[4] Nicolas and Descos,[28] Ravenel,[31] Dobroklonski,[14] Rabinowitsch,[30] Vallée,[46] Von Behring,[6] Calmette and Guérin,[10] Schlossmann and Engle,[34 35] Vansteenberghe and Grysez,[47] Petit,[29] the United States Bureau of Animal Industry,[38 39] the British Royal Commission on Tuberculosis, and others too numerous to mention without coming to the conclusion that tubercle bacilli easily pass through the intestinal mucosa, from there into the lymph stream, and from it into the circulation, to be filtered out by the lung, where they most commonly cause disease.

The most important investigations are probably those of Calmette and his associates, now published in book form. They claim not only that pulmonary tuberculosis by the way of the intestine is possible but also that this is the common mode of infection. They point out that dust particles that enter the lung never penetrate deeper than the first branches of the bronchi, that bacilli may pass through the mesenteric glands as well as the intestinal mucosa without causing

lesions, and that tuberculous processes in the lung never begin in the bronchi or alveoli but always in the capillaries, especially the finest capillary network of the subpleural tissue, etc.[11]

Relative to the beginning of the tuberculous process in the lung, Aufrecht[2] has this to say: "The fact is that the initial changes in the apices in the lung, as I have convinced myself by repeated anatomical examinations, do not spread from the terminal branches of the bronchi." He further says: "I have proved the cheesy tubercle in the lung to be associated, not with the final branches of the air tubes, but with the terminal capillaries of the pulmonary arteries." Köhler,[3] in reviewing Aufrecht's work, justly remarks: "It deserves wide recognition, as it supplies important arguments for a thorough revision of the older views about the development of pulmonary tuberculosis."

The mode of infection with tuberculosis, judged from the best information we have to-day, stamps tubercle bacilli in articles of food as the greatest tuberculous danger to which public health is exposed.

THE INHALATION THEORY OF INFECTION.

The inhalation theory of tuberculosis can have no validity unless it can be shown, first, that it is possible to respire infectious material not only into the larger air passages but deeply into the lung, and second, that infectious material can be suspended in the air without previously losing its virulence.

Anyone who takes the trouble to consider the moist-walled, tortuous passages through which air passes before it reaches the apices of the lung, in which tuberculous disease begins more commonly than elsewhere, and bears in mind that the respiratory process is largely one of diffusion and not altogether one of actively moving currents of air, will probably find reasons to doubt that solid particles of relatively high specific gravity, sustained in a fluid, like air, of much lower specific gravity, can be carried far or deeply into the lung. A theory like the inhalation theory that requires the suspension of physical laws is out of harmony with nature. It is simply untrue, because physical or natural laws can neither be suspended nor violated.

Again, as to infectious material suspended in the air: This must come from one of two sources, namely, the infectious spray from the mouths of tuberculous persons or finely pulverized dust from tuberculous sputum. Flügge[16] and Heymann[20] proved that the earlier work of Cornet, which seemed to show that dust from tuberculous sputum is extremely dangerous, could not be relied upon, and they further proved that dust from sputum is coarse, not easily sustained

in the air, and, at the worst, of very brief infectivity. Cadéac [9] declares that dust ground from tuberculous sputum is harmless to both the digestive and respiratory tracts, and I feel assured from the results obtained with my own work that it is difficult to understand how tuberculous sputum can be converted into virulent tuberculous dust capable of floating in the air.

Flügge and his followers still adhere to the inhalation theory, but in the place of dust they substitute the infectious spray, which, as a little thought will show, can be dangerous to the respiratory tract only in the close proximity of individuals affected with advanced tuberculosis, and hence is not sufficient to explain the frequency with which tuberculosis occurs, even if it could—which is doubtful—penetrate deeply into the lung.

The inhalation theory, critically examined, evidently does not give us reason to undervalue the danger from virulent, fresh tubercle bacilli in milk and dairy products.

CONCLUSION.

And now, in conclusion, a few words about the distinction made between human and bovine tubercle bacilli. When we examine the evidence of the Bureau of Animal Industry, [43] [24] [25] the British Royal Commission on Tuberculosis, and a host of independent investigators whose names it is out of the question to give here, we find, though there may be two morphologically distinct types of tubercle bacilli, that they are connected by transition forms, and that if the two types (one more commonly found in man and the other in cattle, but neither exclusively restricted to man or cattle) really differ in an important way, it is only that the type commoner in cattle is of much higher pathogenic virulence than that commoner in man.

To my mind it is reasonable at present to believe that we have two great sources from which tubercle bacilli are disseminated in a way that is dangerous to public health—tuberculous persons and tuberculous dairy cattle. The former is, no doubt, the more important source, but with regard to the latter we must not forget the significant fact that tubercle bacilli in milk, cream, ice cream, butter, cheese, and oleomargarin are not on floors, or on pavements, or in or on places from which they may or may not enter our bodies; they are located in articles of food commercially distributed among persons to be eaten, in most instances, in a raw state, and therefore are inevitably consumed in large quantities.

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THE TUBERCULIN TEST: ITS METHOD OF APPLICATION, VALUE, AND RELIABILITY.

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THE DIAGNOSIS OF TUBERCULOSIS.

The symptoms of tuberculosis in cattle are not sufficiently prominent, except in advanced stages or when superficially located, to enable one to diagnose this disease by the ordinary methods of physical examination. And the cattle may, without showing any clinical symptoms, be in such a stage of tuberculosis as to render them capable of spreading disease. Indeed, an animal may be fat and sleek, eat and milk well, have a bright, glossy coat, and be apparently in the pink of condition and still be passing tubercle bacilli through the feces or by an occasional cough, and thus endanger all the healthy cattle in the herd. Consequently such adventitious aids to diagnosis as animal inoculation, biological test, serum agglutination reaction, and the tuberculin test are made use of in arriving at a definite opinion relative to the presence or absence of this disease. The value of all but the last of these is discounted by the technique required and their impracticability, while the tuberculin test is most satisfactory and is the best diagnostic agent known for the disease.

THE ORIGIN OF THE TUBERCULIN TEST.

Tuberculin was invented by Koch in 1890, and was first used experimentally in treating tuberculosis in man. In these cases it was observed that its injection was followed by a rise of temperature, which led veterinarians to apply tuberculin to suspected animals to see if a similar reaction resulted. Numerous experiments showed this to be the case, and since 1891 the use of tuberculin as a diagnostic agent for tuberculosis of cattle has been almost universally adopted in all parts of the civilized world. No one thinks of accepting tuberculin as an absolutely infallible agent, but it is immeasurably more dependable than any other method that has ever been used.

THE NATURE AND APPLICATION OF TUBERCULIN.

Tuberculin is the sterilized and filtered glycerin extract of cultures of tubercle bacilli. It contains the cooked products of the growth

of these bacilli, but not the bacilli themselves. Consequently, when this substance is injected under the skin of an animal it is absolutely unable to produce the disease, cause abortion, or otherwise injure the animal. In case the injected animal is normal there is no more effect upon the system than would be expected from the injection of sterile water. However, if the animal is tuberculous, a decided rise of temperature will follow the use of tuberculin.

In practice the tuberculin test is applied by first taking a sufficient number of temperatures, usually three, at intervals of two hours to ascertain the normal variation of temperature of the animal to be tested. The dose of tuberculin (which should always be specified on the label) is then injected hypodermically between 8 and 10 p. m. on the day of taking the preliminary temperatures.[a] On the following day the "after" temperatures are recorded every two hours, beginning at 6 a. m. and continuing until twenty hours following the injection.

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[a] Although the subcutaneous tuberculin test in bovines, when correctly applied, proves reliable in about 97 per cent of cases, there still remains a prejudice against this form of testing among farmers and dairymen, which has been difficult to overcome. It is therefore natural that any new method which may facilitate the diagnosis of tuberculosis should be accompanied by great interest. Of the various biological methods of diagnosing tuberculosis, the greatest interest has been manifested in the last few months in the cuti reaction of von Pirquet and the ophthalmo reaction of Wolff-Eisner and Calmette. As their names imply, these tests consist in the application of the tuberculin to the scarified skin and to the eye, respectively, of the animal to be tested.

The very favorable results which were reported from the application of both of the above-mentioned methods excited a great deal of interest among investigators, and soon numerous results of the experiments were published, which, however, were not uniformly favorable for either of these tests. The best results were apparently obtained from the ophthalmo reaction, and if this method should prove reliable the simple method of its application would greatly aid in the early diagnosis of tuberculosis. Thus, up to the present time the ophthalmo tuberculin test has been principally applied to the human, especially infants, and while the results obtained in these tests are very encouraging, the reactions and failures were never, or only in the earliest instances, verified by post-mortem examination. It appears, therefore, desirable to test the reliability of this reaction on animals in which the reaction may be controlled by autopsies or by the known reliability of subcutaneous tuberculin test. This has been undertaken by various investigators, including the writer, and while many of the results obtained were unsatisfactory, the general findings are somewhat encouraging. The different results which were obtained might possibly be attributed to the various preparations of tuberculin which have been employed and the different strengths in which the tuberculin was applied. The varied results thus far obtained make the reliability of the ophthalmo tuberculin test for the diagnosis of tuberculosis in bovines questionable, and it will be necessary to perfect this method by further experiments. If this method of testing should prove as reliable as the subcutaneous tuberculin test, it would unquestionably greatly facilitate the eradication of tuber-

THE VALUE AND RELIABILITY OF THE TUBERCULIN TEST.

By means of the tuberculin test an accurate diagnosis may be made in over 97 per cent of the cases tested.[a] The relatively few failures in diagnosis are included among two classes of cattle. The first class contains those that are tuberculous but which do not react either because of the slight effect of an ordinary-sized dose of tuberculin on an advanced case of the disease with so much natural tuberculin already in the system, or on account of a previous test with tuberculin which produces a tolerance to this material lasting for about six weeks. The second class includes those that are not tuberculous but which show an elevation of temperature as a result of (*a*) advanced pregnancy; (*b*) the excitement of œstrum; (*c*) concurrent diseases, as inflammation of the lungs, intestines, uterus, udder, or other parts, abortion, retention of afterbirth, indigestion, etc.; (*d*) inclosure in a hot, stuffy stable, especially in summer, or exposure to cold drafts or rains, or (*e*) any change in the method of feeding, watering, or stabling of the animal during the test.

Notwithstanding all these possibilities of error, the results of thousands of tests show that in less than 3 per cent of the cases tested do these failures actually occur. In the first class the chances of error are decidedly reduced by the skilled veterinarian by making careful physical examination and diagnosing these advanced cases, and by the injection of double or triple doses into all recently tested cattle, with the taking of the after temperatures beginning two hours following the injection and continuing hourly for twenty hours. In the second class errors are avoided by eliminating those cases from the test that are nearing parturition or are in heat, or show evidence of the previously mentioned diseases, or exhibit temperatures sufficiently

culosis, inasmuch as farmers and dairymen probably would not object to this external method of applying the test as they do to the subcutaneous tuberculin injection.

The changes in the eye resulting from a marked reaction are characteristic; intolerance to light and an increased secretion of tears are the first indications of the reaction, which may be followed by more severe symptoms, as marked congestion of the conjunctiva, a whitish film-like exudate over the bulbar conjunctiva, and a grayish yellow discharge from the eye, which, running down the face, forms crusts. The test is applied to only one eye, and in the reaction the other or control eye should remain normal.

Thus far the ophthalmo and cuti tuberculin tests can not be recommended for general practice as methods of diagnosing tuberculosis of bovines, and they will require further work and perfection before they should pass from the experimental stage and be adopted in place of the present reliable subcutaneous application.

[a] Reports of tuberculin tests made in the fifteen years from 1893 to 1908 by Federal, State, and other officers with tuberculin prepared by the Bureau of Animal Industry show that out of 24,784 reacting cattle slaughtered, lesions of tuberculosis were found in 24,387, a percentage of 98.39.

high to make them unreliable for use as normal. Then, in reading after temperatures it is advisable not to recognize as a reaction an elevation of temperature less than 2° F., or one which at the same time does not go above 103.8° F., and the temperature reaction must likewise have the characteristic rainbow curve. (Those cases which approximate but do not reach this standard should be considered as suspicious and held for a retest six weeks later.) In addition, a satisfactory tuberculin must be used; also an accurate thermometer and a reliable syringe in order that a sufficient dose of tuberculin may be given. Finally, the number of apparent errors of the tuberculin test will be greatly diminished if a careful post-mortem examination is made, giving especial attention to the lymph glands.

This low percentage of failures being the case, cattle owners should welcome the tuberculin test not only for their own interest but for the welfare of the public as well. Where this method of diagnosing the disease has been adopted tuberculosis is gradually being eradicated, while it is spreading rapidly and becoming widely disseminated in those districts where the tuberculin test has not been employed. Without its use the disease can not be controlled and the cattle owner is confronted with serious and continuous losses; with its use the disease can be eradicated from the herd, a clean herd established, and the danger of its spread to man removed. Tuberculin may, therefore, be considered a most beneficial discovery for the stock raiser. Strange to say, many of these men have been incredulous, antagonistic, or prejudiced against the tuberculin test by misinterpreting published statements, by incorrect, unsubstantiated, or exaggerated reports, and by alleged injurious effects to healthy cattle.

Law [a] has clearly stated the question when he says:

> Many stock owners still entertain an ignorant and unwarranted dread of the tuberculin test. It is true that when recklessly used by ignorant and careless people it may be made a root of evil, yet as employed by the intelligent and careful expert it is not only perfectly safe, but it is the only known means of ascertaining approximately the actual number affected in a given herd. In most infected herds, living under what are in other respects good hygienic conditions, two-thirds or three-fourths are not to be detected without its aid, so that in clearing a herd from tuberculosis, and placing both herd and products above suspicion, the test becomes essential.
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> * * * * * * *
>
> In skilled hands the tuberculin test will show at least nine-tenths of all cases of tuberculosis when other methods of diagnosis will not detect one-tenth.

It is perfectly natural that there should be objection to its use among those who are not acquainted with its method of preparation or its properties; but it is difficult to explain the antagonism of farmers who are familiar with the facts connected with the manufacture

[a] Text Book of Veterinary Medicine, vol. 4, pp. 458, 465. Ithaca, N. Y., 1902.

and use of tuberculin. Probably the most popular objection to tuberculin is that it is too searching, since it discovers cases in which the lesions are small and obscure. While this fact is admitted, it should also be borne in mind that such a small lesion to-day may break down and become widely disseminated in a relatively short period. Therefore any cow affected with tuberculosis, even to a slight degree, must be considered as probably dangerous not only to the other animals in the herd but also to the consumer of her products.

THE HARMLESSNESS OF TUBERCULIN.

Furthermore, tuberculin must be considered as harmless for healthy animals in view of the results revealed by numerous tests covering vast numbers of animals. And it has also been clearly demonstrated that tuberculin interferes in no way with the milking function in healthy cattle; neither in the quantity of milk nor in butterfat value has any variation been detected.

Nocard and Leclainche[a] state:

> Direct experiments and observations collected by thousands show that the tuberculin injections have no unfavorable effect. With healthy animals the system is indifferent to the inoculation; with tuberculous animals it causes only slight changes, which are not at all serious.

DISPOSAL OF AND INDEMNITY FOR REACTING ANIMALS.

Most of the objections to tuberculin would probably be removed if some method of compensation for the reacting animals could be devised. Thus, in Pennsylvania, where tuberculosis is being eradicated with more success than in any other State, and where there are usually three times as many voluntary requests on file for the application of the test as can be made, all reacting animals are paid for by the State. As the suppression of tuberculosis is a public health measure, it would appear perfectly logical for the State governments to reimburse cattle owners appropriately for the animals condemned and slaughtered. Provision could be made to pay 70 per cent of the appraised value of the condemned animals, not to exceed $30 per head for common stock or $60 for registered stock. Such legislation should also include a requirement for the testing of all cattle coming into the State.

All tuberculous animals should be slaughtered in abattoirs having competent inspection, and the money obtained from carcasses which are inspected and passed for food and from the hide and offal of those carcasses condemned as unfit for food should be applied as part payment on the indemnity for their respective owners. The payment of indemnity for tuberculous animals is a good business policy and

[a] Les Maladies Microbiennes des Animaux, vol. 2, p. 85. Paris, 1903.

would do more toward making the tuberculin test popular with cattle owners than any other possible action. And as a corollary of the latter more testing would be performed and more tuberculous cattle would be discovered at the start, but the gradual suppression of the disease would soon be manifest, as has been noted in Pennsylvania and Denmark. Furthermore, as Stiles has mentioned, if tuberculosis can be eradicated from dairy herds with but slight loss to the owner, the increase in the price of milk would naturally be inhibited, and the children of poor families would consequently be in less danger of having this very important article of their diet decreased.

CONCLUSIONS REGARDING THE TUBERCULIN TEST.

As a result of the careful study of the tuberculin test, Salmon [a] draws the following conclusions:

1. That the tuberculin test is a wonderfully accurate method of determining whether an animal is affected with tuberculosis.
2. That by the use of tuberculin the animals diseased with tuberculosis may be detected and removed from the herd, thereby eradicating the disease.
3. That tuberculin has no injurious effect upon healthy cattle.
4. That the comparatively small number of cattle which have aborted, suffered in health, or fallen off in condition after the tuberculin test were either diseased before the test was made or were affected by some cause other than the tuberculin.

SUMMARY OF DIRECTIONS FOR MAKING THE TUBERCULIN TEST.

1. Stable cattle under usual conditions and among usual surroundings, feeding and watering in the customary manner.

2. Make a physical examination of each animal, and give to each one some designation by which the animal will be known throughout the test.

3. Take each animal's temperature at least three times at two or three hour intervals on the day of injection; for instance, at 2, 5, and 8 p. m.

4. At 8 or 10 p. m. inject a dose of tuberculin under the skin in the region of the shoulder, using a sterile hypodermic syringe after disinfecting the skin at the seat of injection with a 5 per cent solution of carbolic acid or a similar antiseptic solution.

5. Tuberculin is not always concentrated to the same degree, and therefore the dose, which should always appear on the label, varies considerably. The dose of imported tuberculin is 0.25 c. c. for an adult cow, and before injection is diluted with sterile water to 2 c. c. The tuberculin made by the Bureau of Animal Industry is prepared so that it will not be necessary to dilute it, and the dose is 2 c. c. for

[a] Yearbook of the United States Department of Agriculture, 1901, p. 592.

an adult animal. Yearlings and 2-year-olds, according to size, should receive from 1 to 1½ c. c., while bulls and very large animals may receive 3 c. c.

6. At 6 a. m. on the day following the injection of tuberculin commence taking temperatures, and continue every two or three hours until the twentieth hour after injection, at which time if there is no tendency for the temperature to rise the test may cease.

7. A rise of 2° F. or more above the maximum temperature observed on the previous day, providing the temperature after injection exceeds 103.8° F., should be regarded as an indication of tuberculosis. Those cases which approximate but do not reach this standard should be considered as suspicious and held for a retest six weeks later, giving double the original dose.

THE ERADICATION OF TUBERCULOSIS IN CATTLE.[a]

By A. D. MELVIN, D. V. S.,
Chief of the Bureau of Animal Industry.

INTRODUCTORY.

Notwithstanding the fact that much has been said upon the subject of the eradication of tuberculosis from our herds and much work has been done in that direction, this disease is, without doubt, upon the increase. The great agitation which has been going on for some time regarding meat and milk inspection has brought the question of tuberculosis before the public in a more direct manner than ever before, and it now occupies an important position in the minds of all reasoning people. Never, therefore, has the time seemed so favorable as at present for securing the indorsement and cooperation of the people in carrying out the work of eradication. In an important movement of this sort it is imperative that it be sustained by public sentiment, for without such indorsement those who are selfishly interested generally place so many obstacles in the way as to frustrate any effort in that direction. Without becoming alarmists to an unnecessary degree, it is the duty of the veterinary profession to keep this matter before the public in such a way that the public may become familiar with the subject and understand the importance of eradication from both an economic and health standpoint.

The very general impression throughout the medical profession until recent years that human tuberculosis was conveyed principally through the medium of dust and by inhalation failed to interest that profession in any movement looking toward the eradication of the disease from live stock. The various recent articles showing the ease with which this disease can apparently be conveyed from cattle to man, however, has awakened the interest of the medical profession, and it is now ready to support any reasonable movement looking to the eradication of the disease from meat and milk producing animals.

THE INCREASING PREVALENCE OF TUBERCULOSIS.

SOME MEAT-INSPECTION FIGURES.

The reports of the Bureau of Animal Industry indicate that tuberculosis among live stock is steadily increasing, as shown by the num-

[a] This paper was presented at the annual convention of the American Veterinary Medical Association, Kansas City, Mo., September 10–13, 1907.

ber of animals found affected at the various slaughtering centers. The increase in the number of cases found is due in part, but only in part, to the increased efficiency of the method of inspection. For the fiscal year ending June 30, 1903, the percentage of tuberculosis found in cattle at abattoirs was 0.169; in 1904, 0.203; in 1905, 0.226; in 1906, 0.259, and in 1907, 0.363. For the months of January, February, and March, 1907, the percentage was 0.434, and for the months of April, May, and June, 1907, it was 0.539. Thus during a period of five years the increase in cases found upon post-mortem examination has been from 0.169 to 0.539 per cent, which surely is an alarming state of affairs.

Recent feeding experiments conducted by the Bureau have proved conclusively that hogs are readily infected through the ingestion of feces and milk from tuberculous cows. The percentage of all cases of tuberculosis of all the hogs slaughtered under Federal inspection for the fiscal year ending June 30, 1907, was 1.43. There is no doubt in the writer's mind that this percentage will be reduced to a negligible quantity as soon as the disease is eradicated from cattle.

CONDITIONS DISCLOSED BY THE TUBERCULIN TEST.

Considerable tuberculin testing of cattle has been done in Washington, D. C., and vicinity for the purpose of assisting the District authorities in obtaining a pure milk supply, and of obtaining for the Bureau further information regarding the extent of tuberculosis in that locality, and for other purposes. The tests made by the Bureau in 1907 showed about 17 per cent of the cattle reacting.

The percentage of tuberculosis in various States, shown by tests conducted by the officials of those States with Bureau tuberculin, indicate from 2.79 to 19.69 per cent of the cows reacting. It should be stated, however, that in all probability the majority of these tests were made in herds where the disease was thought to exist, and on that account the percentage may be higher than it would be if all the cows of a certain section were tested.

The recent agitation against the milk of tuberculous cows as human food has had the effect of causing many herds to be examined, with astonishing results not only to the owners but to the officials themselves. Can it be wondered at that so many infants and children die of intestinal tuberculosis when so many of the cows from which the milk is obtained are tuberculous?

THE IMPORTANCE OF ERADICATION AS AN ECONOMIC MEASURE.

Without considering the matter as a public health question, but looking at it entirely from an economic standpoint and as a business proposition, live-stock raisers can not afford to have tuberculosis in their herds. As an illustration, Argentina requires that all cattle

imported into that country shall be subjected to the tuberculin test upon arrival, and as a consequence exporters from the United States have had the test made on cattle intended for shipment. The results of these tests showed that in some of the purebred herds nearly 50 per cent of the animals were diseased, and in consequence many sales were lost.

When the practice becomes general for all buyers of breeding cattle to have animals tested before placing them in their herds the breeder of strictly healthy cattle will be much sought after. Already some breeders of purebred cattle have established or are arranging to establish such herds. As soon as breeders fully understand the fact that it is unprofitable to go on breeding cattle while tuberculosis exists in their herds much of the objection raised against the sale of live stock subject to inspection will disappear, for it would be worth the price of several condemned animals for the owner of a valuable herd to know the fact as early as possible if the disease exists in his herd, as the longer he delays in taking steps to prevent its spread the greater will be his loss eventually.

The recent effort of the large packing interests to buy all dairy cows subject to post-mortem inspection shows how serious the plague is becoming. Sooner or later the man who raises tuberculous animals must suffer the loss, unless the loss is paid for out of public funds; and when the loss is placed upon the producer we may then know that the end of the disease is in sight.

Some years ago the Bureau of Animal Industry, in order to protect as far as possible American breeders of cattle from the danger of tuberculosis in imported stock, issued an order requiring all cattle imported for breeding purposes to be subjected to the tuberculin test. The wisdom of this step can be shown by merely stating that 19.7 per cent of the cattle tested since that time have reacted, and that from several foreign herds no cattle are even considered for testing on account of the general infection existing in those herds. Unless some steps are taken soon to eradicate the disease from our own herds, will not the same conditions exist in this country within a few years, if they do not already obtain in some instances?

THE RELIABILITY OF THE TUBERCULIN TEST.

There has been considerable incredulity with reference to the tuberculin test, particularly among those opposed to the movement to stamp out the disease, but the statements of such persons should not be given very serious consideration, except as they may be the means of prejudicing the uninformed against the tests. There is no more reliable diagnostic agent than properly prepared tuberculin in the hands of the careful observer. The reports received by the Bureau of Animal Industry from State officials from all parts of

the United States of tests made by competent veterinarians absolutely confirm this statement. Frequently affected animals give little or no reaction or a subnormal temperature, but in these cases any veterinarian of average ability should be able to diagnose the disease by physical examination alone, as in nearly all such cases the disease has become so generalized that a mistake should not be possible. It is understood, of course, that tuberculin should be administered by a reliable veterinarian and that in addition to the test a physical examination should be made of the cattle.

That impotent tuberculin has been on the market is a fact which has been demonstrated by the Bureau, and at its request Congress gave to it authority to make tests of tuberculin, vaccines, and similar products found on the markets, and to publish results. Such tests are now being made, and if any inferior agents are found public notice of that fact will be given. The use of worthless tuberculin may to some degree have been the means of prejudicing some veterinary practitioners, as well as other persons, against the use of any tuberculin.

SOME MEASURES FOR THE ERADICATION OF TUBERCULOSIS.

METHODS USED IN DAIRY HERDS.

In various sections where an effort has been made to secure a wholesome milk supply many dairymen have been found ready of their own accord to assist in the work of eradication. Many others would do so with some small financial assistance. Another class, however, would have to be forced to submit their cattle for examination. As the eradication of the disease in such cases is undertaken as a public health measure, it would seem reasonable that the States should assist in recompensing, at least in part, the dairymen whose cattle are slaughtered. Many of these dairies consist of highly bred cattle, and in such cases it is often found advisable to employ the Bang method of segregating the reacting animals and using them for breeding purposes under certain precautions rather than to slaughter them.

The following is a form of agreement prepared by the Bureau of Animal Industry and required as the consideration for testing a herd:

[United States Department of Agriculture, Bureau of Animal Industry.]

AGREEMENT.

In consideration of the testing of my herd of cattle by the Bureau of Animal Industry of the United States Department of Agriculture and the assistance of said Bureau in enabling me to produce and maintain a herd of cattle free from the contamination of tuberculosis, I [name of owner], of [post-office address],

owner of said herd of cattle, comprising [number and kinds over 6 months old; number and kinds under 6 months old], do hereby agree as follows:

1. I will cause all animals which react to the tuberculin test, and which also show other marked symptoms of tuberculosis, to be slaughtered within a reasonable time under the United States meat-inspection regulations, and I will cause the carcasses of said animals to be disposed of according to the meat-inspection regulations of the Bureau of Animal Industry, based upon the lesions found upon inspection.

2. I will cause all animals which react to the tuberculin test, but which show no other evidence of tuberculosis, either to be slaughtered and disposed of as herein provided for animals which show also other evidence of tuberculosis, or I will cause such animals to be removed from the herd and portion of the farm upon which the healthy animals of the herd are maintained, and I will cause the diseased animals to be segregated from the healthy animals, and thereafter they shall remain so segregated.

3. In all cases where the milk from such segregated reacting cows is to be used for any purpose whatever I will cause the said milk to be sterilized.

4. Segregated reacting bulls may be used for breeding, provided they are held on leash and are not permitted to leave the premises reserved for their use, and provided the healthy cows bred to such bulls are not unduly exposed to infected premises or to other diseased cattle.

5. I will cause the young from segregated reacting animals to be removed from their mothers at birth, and will not permit the said young to suck their mothers.

6. Any part of my premises contaminated by reacting animals will be submitted by me to a thorough disinfection under the direction or supervision of the Bureau of Animal Industry.

7. All cattle owned by me, both healthy and tuberculous, I will mark, or allow to be marked, in such manner as to enable their identity to be retained, and I will not change the location of or slaughter any tuberculous cattle except after due and timely notification to the Bureau of Animal Industry, stating the exact nature of the change of location, or the exact date, name, and address of the official establishment at which the animal or animals are to be slaughtered.

8. I will add no cattle to the said herd which have not passed a tuberculin test administered by an authorized public agent qualified to perform such test or by an inspector of the Bureau of Animal Industry.

9. I will comply with all reasonable sanitary measures which are indicated by the proper officials of the State or Territory wherein my herd is located, or by the local board of health under whose permit I am disposing of dairy products, or by the Bureau of Animal Industry.

In witness whereof I have signed this agreement this _____ day of _____, one thousand nine hundred and ____.

_____,
Owner of the _____ herd.

(Address) _____,
_____.

Witness:
_____.

TRACING ORIGIN OF ANIMALS FOUND DISEASED IN MEAT INSPECTION.

This Bureau has recently undertaken to ascertain the origin of all tuberculous cattle slaughtered at establishments where the Federal

meat inspection is maintained. The information thus obtained is transmitted to the authorities of the various States from which the animals are shipped, and it is hoped that it will be used in endeavoring to locate the centers where infection exists and to eradicate the disease. When a system of cooperation can be effected between the State and Federal governments, providing for a general plan of tagging all dairy cows shipped to market centers for slaughter, then the work of locating these disease centers will be greatly simplified. Had the packers been successful in their recent efforts to buy all such cattle subject to inspection, such a system of tagging would have been necessary in order for the identity of the animal to be retained.

INTERSTATE QUARANTINE MAY BECOME NECESSARY.

It may at some time be necessary for the Federal Government to quarantine against the interstate shipment of cows from certain States where the disease prevails to a considerable extent and require a strict supervision over all animals removed from such States for interstate shipment, and only remove the quarantine from sections of a State when it has been demonstrated that the disease has been either eradicated or is under strict local quarantine.

CONCLUSION.

In my opinion the time is very near at hand when we must face the problem of eradicating this plague from the herds of the country. It is therefore well for veterinarians, stock raisers, sanitary officers, and others concerned to give the subject most careful thought and consideration, so that the problem may be dealt with in the most practical and effective way. It means the expenditure of millions of dollars of public money and a great financial loss to individuals. In a movement of this magnitude it is necessary to have the support of the public and of the live-stock owners in general in order to meet with success, and they should be informed as to the great danger of tuberculosis, both from the economic and health points of view. From either standpoint the eradication of the disease is highly desirable, and the advantage to be gained will, in my judgment, abundantly justify the heavy expense involved.

TUBERCULOSIS OF HOGS: ITS CAUSE AND SUPPRESSION.

By John R. Mohler, A. M., V. M. D.,
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and

Henry J. Washburn, D. V. S.,
Assistant Chief of the Pathological Division.

INTRODUCTION.

Tuberculosis in the human family has been lessening materially during the past fifteen years, but reports from the various meat-packing centers of the country fail to show the same encouraging condition regarding tuberculosis in hogs during the same space of time. It must be admitted that reports have come from several localities during the past four years showing a decrease in the number of tuberculous swine sent to market, but a review of the collective records of the country at large shows an increase rather than a decrease in the number of swine affected. Indeed, there is probably no disease of hogs, not even excepting hog cholera, which is causing heavier losses to the hog raiser than tuberculosis, and it is also the cause of great loss to the packers and of much anxiety to the veterinary inspector of meats. Until recent years tuberculosis had been looked upon as of uncommon occurrence, and only of importance from a meat-inspection standpoint; but to-day it must be considered as a general veterinary problem, theoretically easy of solution, which should receive the careful attention of all sanitarians.

The swine of this country January 1, 1908, according to estimates of the Bureau of Statistics of the Department of Agriculture, numbered 56,084,000, and their value at that time was $339,030,000. From these figures one may partially realize the serious menace to the hog-raising industry which is offered by a disease which affects almost 1.5 per cent of all hogs slaughtered at the abattoirs of this country which have Federal inspection. Reports from European abattoirs show that tuberculosis is far more widespread among their hogs than among ours, some of the returns showing as high as 5.5 to 7.5 per cent. It is to be hoped that the spread of the disease in this country may be checked, and that concerted action by the stock owners and veterinarians may lead to the complete eradication of this costly affection.

The small amount of money required to begin hog raising and the quick returns on the capital invested make this industry an attractive one to the small farmer. The hog will make a pound of gain on less feed than most live stock, and will profitably utilize waste food products of every variety if properly prepared for him. As tuberculosis in this species is chiefly acquired by ingestion, the significance of the latter statement is obvious.

Tuberculosis of hogs is closely associated with the same malady in cattle. The reason for this is apparent when one considers the close relations of these two species of domestic animals upon nearly every farm. The Bureau of Animal Industry is at present endeavoring to locate infected farms, or at least infected localities, and to ascertain the direct cause of the spread of the disease in these districts. Owing to the number of hands through which hogs go before reaching the abattoirs this is not an easy proposition, but it can be and is being accomplished. Already through cooperation with the State authorities a large number of infected farms have been definitely located. The conditions on these farms have been investigated, the source of the disease determined, and methods for its suppression recommended. In Wisconsin the Bureau and State officials have been working with these ends in view. When hogs have been found to be tuberculous and the farm from which they came has been located, the State veterinarian is notified, and he is empowered by law to quarantine any farm when he suspects the presence of a contagious disease thereon. He then applies the tuberculin test to the cattle on the farm and otherwise looks for the source of infection. This frequently results in finding the cattle tuberculous. Similar cooperation has recently been taken up with Nebraska, Iowa, and Minnesota, and the results are equally encouraging.

This cooperation with the State is of great value, and the results would be of greater magnitude if State legislation could be secured compelling the tagging of all hogs going to slaughter, whereby these animals if found tuberculous could be immediately traced to their point of origin and the source of infection removed. It is evident that the suppression of hog tuberculosis would save the country millions of dollars annually, and when it is realized that there are vast numbers of tuberculous hogs killed in abattoirs having no inspection of any kind, it can be seen that the danger to human life from this source would at the same time be removed.

PREVALENCE OF THE DISEASE.

The prevalence of tuberculosis among swine must be judged from abattoir statistics entirely. Thus it has been noted from the records kept by the Bureau of Animal Industry that some sections of the country contribute a far greater proportion of diseased animals than

others. Hogs from Arkansas, Oklahoma, and Texas are remarkably free from this disease, due probably to the method of caring for them, or rather the lack of caring for them. They are not hampered in feed lots as those are in the sections where the disease is mostly found, but are allowed to roam over large areas of pasture and to shift for themselves, and when they are found affected the majority of them show very slight lesions. Furthermore, no prolonged feeding is practiced in narrow bounds as in the corn belt. Lastly, there are relatively few dairies in these sections, and likewise few tuberculous cattle. On the other hand, the hogs are carried from birth to maturity on some form of pasture, as alfalfa, oats, corn, cowpeas, sorghum, rape, and peanuts all the year round. The hogs of the forest region of Hungary which are pasture fed are likewise rarely tuberculous, according to Hertwig, and there can be no doubt that swine fed on entirely vegetable food, as corn and roughage, are proportionately less affected than those fed on dairy products or behind diseased cattle.

A great many hogs in Texas are raised on alfalfa supplemented with corn, and the result is clearly shown in the Bureau statistics which indicate that from January 1 to June 30, 1907, only one-tenth of 1 per cent of over 325,000 hogs slaughtered at Fort Worth showed tuberculous lesions, while only 51, or 0.016 per cent, were condemned as unfit for food. In striking contrast to this may be given the percentages for the same period of three cities in one of the leading dairy States, which show 3.1 per cent, 3.4 per cent, and 6.4 per cent, respectively, of the hogs slaughtered to be affected with tuberculosis. There are a large number of cooperative creameries in the territory contiguous to the three cities alluded to, and the raw skimmed milk is taken home by the patrons for their hogs. Samples of separator slime from the two creameries in the town showing the largest number of tuberculous hogs were injected into guinea pigs and in one instance virulent tubercle bacilli were recovered.

The hog buyers for packing houses are from bitter experience gradually becoming familiar with these conditions and are avoiding certain sections of certain States, and there are at least two eastern packers who will not under any conditions kill hogs from one of the badly infected States. In other localities the packers are beginning to take self-protective measures so as to have the feeder of diseased hogs bear the burden, and many of the smaller establishments in the Central West are buying hogs subject to post-mortem inspection. This attack on the farmer's purse will probably have more beneficial results in making him fully alive to the seriousness of the situation than any other procedure.

In an endeavor to trace the origin of the infection of tuberculous hogs that were arriving at one of the packing plants of Iowa, Rogers of

the Bureau of Animal Industry for some time carried on an experiment which consisted in tagging the hogs that were hauled to market at that place in wagons, before they were removed from the farmers' wagons, and later using these tags as means of identification in case tuberculosis was found to exist in any of the hogs at the time of slaughter. In this manner 3,420 hogs were tagged, and on tracing them to their final disposal it was learned that all of the tuberculous live stock brought to that market came from a few farms—less than 6 per cent of the total, while the remaining 94 per cent of the farms were free from the disease. This proportion of noninfected farms should give great encouragement to any efforts that may be made to eradicate the disease from the State. It was further noted that the successive shipments of hogs marketed by certain farmers always contained tuberculous animals, and in at least two instances the entire consignments were condemned for tuberculosis at the time of slaughter.

PREVALENCE OF TUBERCULOSIS IN FOREIGN COUNTRIES.

Statistics of the sanitary inspection of the Federal slaughterhouses in the Argentine Republic show that the percentage of tuberculous swine is greater than that of tuberculous cattle. This fact is also true in this country, although the contrary is shown in the greater part of the European countries.

In the abattoirs of Buenos Aires the percentage of tuberculous swine for several years past was as follows:

Year.	Per cent.	Year.	Per cent.
1898	6.50	1903	10.86
1899	6.50	1904	10.23
1900	8.90	1905 to November	8.98

In the abattoirs of Liniers at the above city the relation of the two forms of tuberculosis in swine is represented by the following figures:

Proportion of generalized and localized tuberculosis of hogs found at abattoirs of Liniers, Buenos Aires.

Year.	Hogs slaughtered.	Affected with generalized tuberculosis.		Affected with localized tuberculosis.	
	Number.	*Number.*	*Per cent.*	*Number.*	*Per cent.*
1898	36,128	1,160	3.21	1,200	3.32
1899	33,066	1,161	3.51	1,273	3.85
1900	37,824	957	2.53	2,420	6.40
1903	43,531	475	1.09	4,255	9.77
1904	41,577	375	.90	3,881	9.33
1905	48,077	630	1.31	3,689	7.67

It is seen that there is a striking difference in the relative percentages of the two forms of tuberculosis in the later years as compared with the earlier ones. In the first two years the proportion of generalized tuberculosis is practically the same as the localized, whereas in the later years the generalized has decreased considerably, while the localized has increased to an even greater degree.

From the report of the operations of the veterinary sanitary service of Paris it seems that the appearance of tuberculosis among the hogs that are sent to the abattoirs of that city for slaughter is comparatively rare. Although the statistics which are preserved may not give exact data as to the frequency of tuberculosis among the hogs of that region, they are still accurate enough to show that the disease does not cause any serious losses to the swine breeders of France. The French explain this slight infection by stating that the heaviest losses always occur in countries in which dairy interests have become largely developed.

Deetz finds that tuberculosis exists among the hogs of Germany in differing degrees in the several regions. It is more prevalent in the northern than in the southern part of the country. He has prepared tables showing the number of tuberculous swine condemned at the various abattoirs and for purposes of comparison has included the numbers of tuberculous cattle which have been found at the same abattoirs. These tables show that tuberculosis, both of swine and cattle, is increasing. For instance, during 1883–4 only 0.53 per cent of the swine slaughtered at Berlin were found to be tuberculous, while the records for 1897–8 show 3.9 per cent tuberculous, and later reached as high as 5.79 per cent in one year, although only animals which appear to be perfectly sound are allowed to enter the Berlin slaughterhouses.

For the entire Kingdom of Saxony a percentage of 4.81 has been reached, while in the Kingdom of Bavaria records kept for nine years show that only in the year 1903 were tuberculous hogs found in excess of 1 per cent.

The records from different cities in Great Britain show considerable variation in the percentage of tuberculous animals found among the pigs slaughtered. Thus the Birkenhead town slaughterhouse reports 207 tuberculous pigs out of 22,852 slaughtered (nearly 1 per cent). The veterinary inspector at the London corporation slaughterhouses at Islington found 75 affected pigs out of 15,225 examined (or about ½ per cent), while returns from the inspector of the Glasgow corporation show that 2,553 affected pigs were found among 60,235 slaughtered (4.24 per cent).

Reports from the Netherlands state that during the examination of 368,428 native pigs that were intended for export to London 5,516 tuberculous animals were found, or 1.5 per cent.

In New Zealand during the fiscal year 1907, out of 100,731 hogs examined 5.89 per cent were found affected with tuberculosis, and 4.55 per cent were partially condemned and 0.87 per cent totally condemned.

Taking into account the foregoing figures for the foreign countries mentioned, one may appreciate more accurately the great tribute which each year is paid to this scourge of man and beast by the hog industry. All statistics show after a general style that the greatest increase in tuberculosis among hogs occurs in those sections where the dairy industry is the most advanced, like Copenhagen and Douzig, in Denmark, which show 15 and 70 per cent, respectively (1897), giving as the principal cause of this the use of the by-products of the dairy in the feeding of swine.

PATHS OF ENTRANCE OF TUBERCLE BACILLI.

As a result of numerous experiments conducted on hogs it has been quite conclusively shown that hog tuberculosis is an ingested disease and that the tubercle bacilli are absorbed almost at the beginning of the alimentary canal. The tonsils of pigs have been examined by several investigators, including ourselves, and tubercle bacilli have been found in the apparently normal tonsillar crypts. From the tonsils to the submaxillary glands is but a very short distance and on a direct line with the lymph current in the lymphatic vessels. This fact, taken into consideration with the infection of the submaxillary glands in over 93 per cent of all tuberculous hogs, shows that the tonsils play a very important part as the portals of entry of the tubercle bacillus. Again, the scavenging propensities of hogs, whereby they eat various substances, rough or smooth, hard or soft, sharp or blunt, including wood, nails, wire, etc., make it quite possible for such things to be taken into the mouth with food in such a way as to cause sufficient abrasion of the mucous membrane to permit the entrance of the bacillus, and its absorption by the lymph vessels and subsequent deposit in the submaxillary gland follow. Young pigs at the time of teething are particularly liable to become infected owing to the abrasions of the mucous membrane resulting from the new teeth. Catarrhal conditions of the buccal mucous membranes, such as are observed in stomatitis, also lower the vitality of the epithelial cells, allowing the entrance of tubercle bacilli.

In a few cases the only lesions observed were in the mesenteric glands, which would indicate that the ingested bacilli had safely passed the usual portal of entrance and had been taken up by the lacteals of the intestinal tract and filtered out in the mesenteric lymph glands. Thus Ryder, in charge of the Boston station of the Bureau, has made a careful post-mortem examination of 59,460 hogs, of which number 50 carcasses showed lesions of the mesenteric glands only.

Of far more frequent occurrence are the lesions of the gastro-hepatic glands and of the bronchial glands. In fact, our study of the lesions of hog tuberculosis shows that next in the order of frequency to the submaxillary gland infection comes the combination of the submaxillary with the bronchial glands, then the submaxillary, bronchial, and gastro-hepatic glands, next the submaxillary, bronchial, and gastro-hepatic glands and the liver.

In a certain small number of cases infection probably occurs directly through the respiratory tract, but these instances are extremely rare. Even more infrequent are those cases of tuberculosis which arise as a result of traumatism, especially the infection of castration wounds by the use of infected instruments or otherwise. One boar has come under our observation whose testicles and mucous membrane of the penis were so markedly tuberculous that the genital tract of the sows covered by him could scarcely have escaped infection.

METHODS OF INFECTION.

The most frequent infection of hogs with tuberculosis, as has just been pointed out, occurs, no doubt, through the digestive tract, and in this mode of infection tuberculosis of cattle is very intimately concerned. In those instances in which a marked increase in the number of tuberculous hogs from a certain locality has been noticed and investigated it has too frequently been found that the hogs in question had been fed upon the by-products of a cream separator or that the carcass of some animal succumbing to tuberculosis had been thrown to them for final disposal. The certainty with which either of these two conditions will lead to the infection of the hogs has not heretofore been appreciated in many quarters.

Another source of infection for swine has been shown to exist in the practice of allowing them to run behind a herd of cattle, where the tubercle bacilli excreted with the feces by a tuberculous bovine may readily infect the hogs. Infection of a litter of pigs by a tuberculous sow presents another source of danger. There are a number of other methods of infection which will be mentioned later, but they should be considered of minor importance and must not detract attention from the leading factors in the production of the vast majority of cases of hog tuberculosis, which are unquestionably the milk and feces of tuberculous cattle. When once these are controlled tuberculosis of swine will forthwith be greatly reduced.

The various sources of infection will now be discussed in the following order: (1) The milk of tuberculous cows; (2) the infected feces of cattle and hogs; (3) the feeding of tuberculous carcasses or slaughterhouse offal; (4) the use of diseased brood sows; (5) the sputa of tuberculous attendants, and (6) tuberculous fowls and infected castration wounds.

INFECTION THROUGH THE MILK OF TUBERCULOUS COWS.

Numerous experiments conducted by many scientists in various countries show a great unanimity relative to the ease with which hogs may contract tuberculosis from being fed on milk of tuberculous cows. Thus Gerlach, Zurn, Bollinger, Wesener, Bang, Peuch, Ernst, Pearson, Hills and Rich, and others, have shown that pigs so fed have become tuberculous in as high as 100 per cent of the hogs fed. Furthermore, the experiments of the Bureau of Animal Industry have shown similar results. When hogs were fed on tuberculous milk for only three days the post-mortem examination held one hundred and seven days later showed that 83.3 per cent of the animals had become tuberculous. When hogs received tuberculous milk for thirty days and were allowed to live fifty days longer, 100 per cent of the animals had developed generalized tuberculosis.

That similar experiences occur under natural conditions on the farm has been proved by tracing certain shipments of tuberculous herds to the farm where they were raised and fattened. In one instance a shipment of 74 hogs showed tuberculosis in 61, and investigation brought out the fact that the swine had been fed on the skimmed milk of a creamery in a near-by town. The separator slime from two of the creameries in this town was obtained for experimental purposes, and the inoculation test showed that one of these samples produced tuberculosis in all the guinea pigs inoculated. It is also of interest to know that the hogs slaughtered at the abattoir in this same town for the six months ending June 30, 1907, were tuberculous to the extent of 6.4 per cent, and in March showed the large percentage of 6.69 per cent.

At the present day centrifugal separators for the removal of the cream from the remaining portions of the milk have come into general use in most creameries and upon many dairy farms. During this process the rapid revolutions of the shaft and disks of the machine throw down at the base of the shaft a deposit consisting of dirt, hair, manure, and other impurities which may have found their way into the milk, and mingling with this mass bacteria may also be found in great numbers.

The charge has been repeatedly made that tubercle bacilli are scattered by means of the common practice of distributing the separated milk, or the separator refuse, among the farmers who constitute the patrons of the creamery. Such charges as this should not be made unless some evidence can be presented in substantiation; therefore careful search has been made of samples of the separator sediment from a number of creameries located in widely removed dairy regions to see if they really harbored virulent tubercle bacilli.

When first received at the laboratory this material is examined microscopically. Following this examination all samples, whether

showing the presence of suspicious bacteria in stained preparations or not, are injected into guinea pigs, where the presence of living tubercle bacilli is soon made manifest by the development of tubercular lesions. As a result of such an examination of the products from 15 creameries it has been definitely shown that 5, or 33⅓ per cent, of the samples examined contained virulent tubercle bacilli.

There are no doubt many creameries to which no milk containing tubercle bacilli is delivered and from which the separated milk when divided among the creamery patrons is free from tubercle bacilli, and consequently furnishes a safe and valuable article of food for the calves and pigs to which it is fed. But there are, unfortunately, others, as above indicated, which receive milk daily from one or more cows so affected with tuberculosis that they excrete tubercle bacilli, and these bacilli find their way in large numbers into the cans of separated milk which are returned to the farmers from these creameries. In this way a single cow with a tuberculous udder may spread the disease to numbers of hogs, and may also infect many farms in a large section of country that have never been contaminated before with this destructive disease. This particular means of disseminating tuberculosis could be absolutely prevented by sterilizing the milk, yet this simple precaution is, in the majority of cases, not taken.

In one State where hand separators are quite frequently used on the farm a lot of tuberculous hogs which contained 36 per cent of tuberculous animals was traced to the farm of the raiser, and the State authorities were notified. The latter made a tuberculin test of the cattle producing the milk, with the result that about 22 per cent of them reacted. It will thus be seen that creameries are not alone incriminated, but the skimmed milk from the hand separator, if it comes from a tuberculous herd, is equally dangerous, and the buttermilk produced at the creamery from the infected separated cream is likewise capable of carrying tubercle bacilli and infecting the animals which consume it.

The one great advantage from a hygienic standpoint which the hand separator has over the public creamery is that the milk from an infected herd is usually fed to the one lot of hogs, while the skimmed milk from the creamery is generally all mixed together in a vat and each farmer takes back with him his pro rata of skimmed milk, which is most likely to be produced by several herds of other people's cattle. Hence the skimmed milk of but one tuberculous herd is liable, as a result of this practice, to contaminate the entire product of the vat into which it is placed. For this reason it behooves hog raisers to see that their skimmed milk has been properly heated before they feed it, and the State authorities to make such heating by creameries compulsory as a simple and easy way of greatly reducing hog tuberculosis.

Borgeaud noticed numerous cases of tuberculosis of the bones in young pigs at abattoirs of Lausanne. Instituting inquiries, he was able to connect the outbreak with the feeding of tuberculous milk. At this same period Borgeaud noticed the arrival of an unusual number of cows affected with tuberculosis of the udder from the neighboring farms. A few years previous to this his attention was called to a farm upon which tuberculosis had assumed the character of an enzootic, two, three, or even more pigs dying each day. The owner was unwilling to admit that the fatalities were due to tuberculosis, but felt sure that his swine must have become infected with rotlauf or cholera. It was, however, learned that the pigs on this farm were being fed upon raw milk from a centrifugal separator. When the practice of boiling the separated milk before giving it to the pigs was inaugurated the disease gradually disappeared from among the hogs shipped from this place.

It is also a common practice on farms to feed to hogs all colostral milk not required by the calf. Unless the cow is free from tuberculosis this is a dangerous practice, although no direct connection with this source of infection has been made in our investigation.

INFECTION BY FECES OF CATTLE AND HOGS.

A very prolific source of infection of hogs with tubercle bacilli, and one which closely rivals tuberculous refuse from public creameries, is to be found in the feces of tuberculous cattle. It is a very common practice to allow hogs to accompany cattle about the feed lot, and while doing this they thoroughly work over the feces, thus saving whatever portions of food have passed undigested through the alimentary tract of the bovine. In herds that are healthy this manner of feeding may be commended because of the economy, but wherever there are tuberculous individuals among the cattle the danger of passing the infection on to the hogs by means of the feces becomes very great.

In a series of investigations which were carried on by the Bureau it was found that the feces of tuberculous cattle are often loaded with tubercle bacilli. To test their virulence, tuberculin-tested hogs were placed in isolated pens where a few shovelfuls of such feces were thrown daily while the hogs were fed upon other food which was free from tubercle bacilli. The result was the infection of 25 per cent of the first lot of hogs and 100 per cent of the second lot that were exposed. The tuberculous condition of the cattle was only shown by the tuberculin test, as they were apparently healthy, having no cough or any visible indications of disease.

A somewhat similar experiment was performed by exposing tuberculin-tested hogs solely to the feces of healthy cattle that were

swallowing small quantities of tubercle culture in their drinking water. The exposure lasted eighty-one days, with the result that 75 per cent of the first lot and 100 per cent of the second lot of hogs contracted tuberculosis.

In a recent examination at the Bureau Experiment Station of the manure passed by 12 cows just purchased from dairy farms in the District of Columbia, and affected with tuberculosis to an extent only demonstrable by the tuberculin test, tubercle bacilli were found by Schroeder in over 41 per cent of the cases, both by microscopic examination and by guinea-pig inoculation. The result of this test led to the suggestion that tuberculous hogs might equally well serve as distributers of tubercle bacilli by means of their feces, and an experiment was at once inaugurated in which a litter of healthy pigs was exposed to possible infection by being brought in contact with the feces of hogs that were known to be affected with lesions of tuberculosis. All other possible sources of infection were excluded; and as there was no development of tuberculosis by any of the pigs, it is probable that the feces of tuberculous hogs may safely be considered less dangerous as a conveyer of infection than the same product of tuberculous cattle.

Only recently a probable instance of infection of hogs by cattle feces came under observation. Of 34 hogs which were marketed in one lot 23 were found diseased, and upon investigation it was ascertained that the owner had a herd of dairy cows, the stable manure from which was thrown into the hog yard. The hogs were given no milk, nor were they permitted to mingle with the cattle, but were pastured and fed on corn and what they could gather from the cow manure. In fact, the latter form of exposure was the only plausible explanation of infection, and this was later accepted when the tuberculin test of the herd revealed 19 out of the 27 cows diseased, which test was confirmed when the cattle were slaughtered and found to be tuberculous, some in an advanced stage.

INFECTION THROUGH FEEDING ON TUBERCULOUS CARCASSES OR SLAUGHTER-HOUSE OFFAL.

It is an all too prevalent custom in some sections for hog raisers to buy up all carcasses of animals that have died from various unknown causes and feed them to their hogs. This is a fertile source of infection with parasites and with whatever infectious disease the animal may perchance have died. Several instances of tuberculous hogs being traced to such an exposure have been found. A prominent example occurred in an eastern abattoir where 31 out of 40 hogs were condemned for tuberculosis. When these animals were traced back to the raiser it was found that he was running a large dairy and that

a dairy inspector had by clinical examination condemned one of his cows for advanced tuberculosis. In order to save something, as the owner stated, from the carcass, he hauled it out to the hog pasture and allowed the hogs to consume it, with the above disastrous results. Hogs that had been previously raised by him had never been condemned, and the lot in question were running on a large pasture, separated from cattle, and apparently had no other opportunity to become infected than by the condemned tuberculous dairy cow.

An equally dangerous source of infection is likewise observed in the methods which obtain among some of the small country slaughterhouses. It is not unusual for these houses to get rid of their blood, intestines, viscera, and other inedible parts by feeding them to hogs, a herd of which is usually kept on the premises. This custom is pregnant with danger and is another fertile source for perpetuating the infectious principle of various infectious and parasitic diseases, and particularly a dietetic disease like tuberculosis. The feeding of offal, etc., to hogs on the premises of abattoirs having Government inspection is not permitted by the Federal meat-inspection regulations, and State and municipal regulations should be equally stringent on this feature, as is the case, for example, in the meat regulations of the city of Philadelphia. As the slaughterhouses where hogs are fed in this manner have no Government inspection, we have no records as to the number that become infected. Such hogs are killed by the butcher on the premises where they are fed, and are marketed as healthy meat.

THE USE OF "TANKAGE" AS FEED FOR HOGS.

Another product of the abattoir, tankage, is in an entirely different class from the above, but it nevertheless has been prominently mentioned from several sources as being the cause of much of the tuberculosis in hogs. As to this, however, we have no confirmatory evidence. Such information as we have is presented below, and it will be seen it points in the other direction.

Tankage is made from the trimmings, inedible viscera, and other parts of the carcass which are placed in the tanks and thoroughly cooked under steam pressure so that it comes out as a sterile product. The grease is removed from the surface and the residue is dried at a high temperature, then ground, screened, and placed in 100-pound bags for shipment. Owing to the dryness of the product there is practically no danger of fermentation taking place.

Tankage, meat meal, and other animal food products as feed for live stock, and particularly for swine, have recently attracted a good deal of attention from the farmers, not only because of the prevailing high price of other feedstuffs but also because of recent experiments indicating that greater growth and more fat can be put on the

animals, and at a less cost per pound, than by any other feedstuffs. Tankage has proven a satisfactory substitute for skimmed milk as an adjunct to corn, experiments showing that hogs can be more quickly and cheaply fattened by such a combination than by corn alone. It is generally agreed among feeders that protein is the most important part of the feeding ration as well as the most difficult to procure and the most expensive. Tankage is very high in protein, varying from 10 to 60 per cent, according to the firm manufacturing it, and is commonly called digester tankage.

It having been stated that the increased use of this material as feed for hogs was the cause of the increase in the number of tuberculous hogs condemned at the abattoirs, many inquiries were sent out by the writers to State experiment stations where tankage had been fed to hogs experimentally, for the purpose of tracing, if possible, any cases of tuberculosis due to the consumption of this product. The following extracts from the replies received are of general interest to hog owners, but fail to implicate tankage in any of the blame for the development of tuberculosis in swine.

Prof. E. T. Robbins, assistant animal husbandman at the Iowa State College, Ames, Iowa, writes:

> This includes all the evidence we have in regard to the matter of tuberculosis from packing-house by-products, and it seems to me that at least it does not indicate that these by-products are a probable source of infection.

Prof. J. H. Skinner, animal husbandman of Purdue University Agricultural Experiment Station, states:

> I may say that we have always carefully examined the hogs that have been fed tankage in our various experiments with this feed, and we have failed, as yet, to discover any tuberculosis in these hogs. We always have some one present when the animals are slaughtered who makes notes on the various organs, and anything of this sort would not be passed by.

From C. S. Plumb, professor of animal husbandry, Ohio State University, we quote:

> I have fed tankage to hogs now for some seven or eight years, and during that time have noted only good results. It may interest you to know that three years ago I obtained some tankage which we fed to our pigs here, and they did not do well; we had swine plague affect the herd and lost a number of young pigs. Suspicion was attached to the tankage, and we discontinued feeding it. The next year, however, the remainder of the tankage, of which there was considerable, was all fed and no injurious effects noted.

Prof. R. S. Shaw, of the Michigan Agricultural College, writes as follows:

> We have been using tankage at this institution as a swine food quite extensively for about three years, both in experimental work and ordinary feeding. The great bulk of our hogs are sold alive. Some of them are dressed and placed on the market by Lansing butchers. Some of them are shipped to Detroit and Buffalo by dealers. In these three years we have dressed approximately

about 200 head of hogs in our own little slaughterhouse. No indications of the presence of this disease have been discovered thus far.

The opinions above given are confirmed by certain feeding experiments conducted by the Bureau with tankage mixed with cotton-seed meal in various proportions and fed to 71 hogs for about six months. No indication of tuberculosis was found, after careful post-mortem examinations, in any of the hogs receiving tankage.

INFECTION FROM DISEASED BROOD SOWS.

A case of this character was thoroughly investigated by Clancy, of the Bureau of Animal Industry, and is full of instructive features. It had been noticed that a certain shipper of hogs to the East St. Louis market occasionally sent in a load containing many tuberculous animals, and close inquiry and consultation of shipping records showed that these loads were mainly composed of hogs from one particular farm. An inspector was consequently detailed to visit this place and to discover, if possible, the source of such wholesale infection. In his report to Washington he wrote:

> But four cows are milked, and no part of their milk is fed to pigs. The brood sows are kept in several widely separated lots on different parts of the farm, and they are moved about frequently.
>
> A physical examination, it would seem, is of minor importance when we consider the evidence which points conclusively to the fact that several of the brood sows must surely be tuberculous.

It was found that 28 tuberculous hogs were shipped from this farm in May, 1902. In July, 1904, 11 affected hogs left the farm, and in September of the same year 14 others followed, and were condemned by Federal inspectors at the abattoirs. In 1905 there were 27 tuberculous swine shipped from this farm, making a total of 80 animals which had contracted tuberculosis on this farm within a period of four years. It was further shown that a year or two previous to the first appearance of tuberculosis among the hogs in question the owner had purchased some imported cattle from a neighbor who was engaged in importing cattle from England. Some of the cattle from the importer's farm were slaughtered about this time and were found to be so badly infected with tuberculosis that the carcasses were totally destroyed. Tuberculosis was conveyed from the importer's farm to the farm under investigation, and after a time made itself manifest among the cattle on the place, with the result that one of them died. Her carcass was hauled out to the feed lot and turned over to the hogs. After this date constant trouble had been experienced through the development of tuberculosis by the hogs at this place.

We must infer that the brood sows on this farm became affected through eating the tuberculous carcass of the cow, and that, retaining

the disease, they continued to infect their offspring for several seasons following. The sows were retained from year to year while their litters were fattened and sent to market, and it was in these young animals that tuberculosis was found to have developed to such remarkable proportions.

McFadyean reports that a litter of young sucking pigs was referred to him for investigation because they were unthrifty, dull, and purging. The remaining swine of the farm consisted of a boar, three sows, and another litter of young pigs, all of which appeared to be perfectly healthy. The pigs were about 7 weeks old at the time of the examination, and in spite of this early age all of them were found to be affected with generalized tuberculosis. No report of the sow which produced these pigs could be obtained other than the statement that she appeared to be quite healthy with no evidences of mammary tuberculosis. McFadyean considers it more than probable that a post-mortem examination of this brood sow would have revealed either tuberculosis of the generative organs or of the mammary glands. The first pig examined led McFadyean to decide that infection must have occurred previous to birth, while the lesions of the other two indicated a later infection by way of the digestive canal.

In an experiment conducted by the Bureau a sow was artificially infected by inserting a long hypodermic needle under the subcutaneous tissues of the mammæ parallel with the skin, and in withdrawing a few drops of tubercle culture were allowed to flow gradually from the point of the needle. The litter of pigs born to this animal all became tuberculous, although the sow on post-mortem showed only six small subcutaneous abscesses the size of hazelnuts. Another experiment was made with a tuberculous sow having a litter of eight pigs; four of the latter were placed in a pen by themselves into which were thrown the feces of the mother. The negative result of this feature of the experiment has already been referred to (p. 225). The remaining four were allowed to suckle the tuberculous sow, and two of them contracted the disease, thus establishing most positively the danger of perpetuating the disease through the use of diseased breeding animals.

INFECTION BY TUBERCULOUS ATTENDANTS.

Attendants and caretakers who feed and care for hogs should be free from tuberculosis, since hogs are susceptible to human tuberculosis. Bang records the appearance of tuberculosis among hogs on a farm where this disease had never been seen before, which resulted from tuberculous attendants who were in the habit of spitting in the hogs' feed and about the premises.

Dinwiddie, as a result of comparative tests of human and bovine tubercle bacilli, reached the conclusion that pigs "are susceptible to infection with both bovine and human tubercle," and to judge from these tests "bovine tubercle is no more active for these animals than human sputum. The kind of pathological changes induced in the two cases are identical. The liability to generalization of the disease in pigs, a feature which has been noticed by other observers, is noticeable also in these inoculation experiments." In a later review of these tests Dinwiddie states that "pigs were found to be readily infected and prone to suffer from generalized disease by inoculation and feeding with both varieties of tubercle or tubercle bacilli in cultures."

The British Royal Commission on Tuberculosis has also shown that hogs are susceptible to human tuberculosis. This commission considers the power of resistance of hogs to the human tubercle bacillus to be considerably less than that possessed by cattle.

Knese reports the infection and loss of an entire litter of 3-months-old pigs consisting of 11 animals. These pigs had been bred upon the premises from healthy stock, and all possible sources of infection could be eliminated save that of sputum from a tuberculous daughter of the family, who was very sick with tuberculosis of the lungs during the entire summer, and who died from the ravages of this disease in the fall. During the progress of the disease the young woman coughed badly, raising large amounts of expectoration which was collected in a dish at the bedside. This dish was emptied into the yard each morning, then washed out and the wash water likewise thrown into the yard. The small pigs had liberty to run about the yard each day, and undoubtedly became infected through contact with the human tuberculous sputum which was so freely placed within their reach.

In a recent conversation with Ryder, in charge of the Boston station of the Bureau, he informed us that out of a lot of 76 hogs that had been fed upon swill gathered from some of the hotels of Boston 37 were found to be tuberculous at the time of slaughter. It can not, of course, be stated positively that any of these animals were infected through material gained from tuberculous people at these hotels, but because of the possibility of such contamination the case is mentioned. It should be stated that the cattle on this farm were healthy, having been frequently tested in the last three or four years, and there was no other apparent source of infection than the hotel swill.

INFECTION FROM TUBERCULOUS FOWLS AND THROUGH CASTRATION WOUNDS.

The frequent association of pigs and fowls has suggested the possibility in European countries that in some cases tuberculosis of hogs

may result from exposure to chickens affected with tuberculosis. As avian tuberculosis is extremely rare in this country, little importance may be attached to this method of infection, although the finding of avian tubercle bacilli in hog tissues by Weber and Bofinger indicates that hogs are susceptible to this form of the disease.

The danger of infection of the scrotum at the time of castrating hogs through the contaminated knife of the operator or otherwise has been reported by Meyer. This method of becoming diseased is likewise of such rare occurrence that to mention it is sufficient for our purpose.

SYMPTOMS OF TUBERCULOSIS IN HOGS.

Few hogs ever show by outward symptoms that they are affected with tuberculosis. In fact, the hogs that disclose tuberculosis at the time of slaughter are frequently the finest appearing animals in the drove when they are brought to the abattoir. Should indications of tuberculosis be present they will usually consist of a general appearance of unthriftiness, which might result from other diseases and therefore does not afford any very definite indication that tuberculosis is present.

Where the disease has progressed to an advanced stage of generalization various symptoms may appear. Abdominal tuberculosis is frequently accompanied by general disturbance of the digestive functions, and constipation or diarrhea may be shown. Advanced pulmonary tuberculosis will be shown by a persistent dry, harsh cough, and by acceleration in breathing, especially on exercise. This cough is similar to that caused by lungworms and can not be differentiated from it.

Interference with both respiratory and digestive functions may be seen when the disease is widely generalized, and the systemic alterations will be shown by progressive emaciation and weakness. Localization of the disease in bones or joints may produce lameness and other visible indications, but these are comparatively very rare.

In the majority of cases no intimation of the presence of the disease will be given until the animal is slaughtered, and the discovery of a number of tuberculous hogs in a drove of apparently prime, well-finished animals is often the cause of great surprise and disappointment to their owner, and in such cases the lesions may be sufficient to prove the disease generalized and the tubercle bacilli to be so widely distributed as to render the meat unfit for food purposes.

Forty-four hogs that had been fed upon the milk of a tuberculous cow for a period of two months at the Oklahoma Agricultural Experiment Station were subjected to official inspection at the abattoir, and 21, or 47.72 per cent, of them were condemned as tuberculous. The effect of tuberculosis on the physical condition of these hogs

was not very marked, as may be seen from the following statement of Doctor Lewis:

> Some of the animals that showed a generalized condition of the disease at the time of the post-mortem examination had had the disease almost a year, yet they were in apparently good physical condition. In one that died from the effects of the disease the physical condition was not such as to cause suspicion of generalized tuberculosis. In fact the entire lot of diseased hogs were in a marketable condition so far as flesh was concerned, and a number of them were killed under official inspection, their condition being such that they were considered fit for market.

Among a lot of hogs in which tuberculosis is known to exist it is occasionally possible to select a tuberculous individual by palpation of the throat, when enlarged cervical lymphatic glands may be detected, which will afford a reasonable ground for a suspicion of tuberculosis. In such a drove a sow with swollen mammæ would likewise suggest the presence of a tuberculous mammitis, but these cases are extremely infrequent.

In those cases where the disease is not characterized by prominent symptoms, but where the animals are suspected of having the disease, the tuberculin test is recommended. This makes it possible to slaughter the reacting animals in the early stages of the disease and thus obtain some remuneration for the carcasses and at the same time get rid of the infection. This is especially important in holding over brood sows, as our experiments have indicated that the milk of these sows may contain tubercle bacilli and thus infect the young pigs.

THE TUBERCULIN TEST.

In reviewing the questions of detection and eradication of tuberculosis in hogs it is noticeable at once that there are but few recorded instances in which reliable tuberculin tests have been made. This may be due to the fact that the temperature of a hog is subject to rapid changes under conditions which would not cause noticeable variations with cattle. These alterations of temperature in individual hogs are so great within short spaces of time, and from apparently insignificant causes, that it seems at first thought that no change caused by the injection of tuberculin could ever be sufficient to permit one to reach any definite conclusion as to the presence or absence of tuberculosis.

In the experiments of Schroeder and Mohler, of the Bureau of Animal Industry, recorded in Bulletin 88, it was found desirable to keep the hogs as quiet as possible during the test, it having been shown that excitement affects the temperatures of hogs very quickly. Each hog was therefore placed in a rectangular crate about twelve hours before the first temperature was taken, and remained in this confinement continuously until the tuberculin test was completed. The

crates, while large enough to permit the hogs to get up and down easily, were still close enough to prevent their turning around or moving backward and forward to such an extent as to interfere with the insertion of the thermometers. Crates that are made 4 feet long, 1 foot 2 inches wide, and 2 feet high, inside measurement, have proven entirely satisfactory in restraining hogs weighing from 50 to 150 pounds. Unless use is made of crates, or of some other satisfactory means of restraint, it is difficult, if not impossible, to obtain trustworthy temperatures of hogs.

The dose of tuberculin used was estimated on a basis of ½ c. c. for each hundredweight, or fraction thereof, of the weight of the animals tested. For instance, a pig weighing 75 to 100 pounds would receive ½ c. c. of tuberculin, while one weighing 150 to 200 pounds would receive 1 c. c. The injections were made directly under the skin at the inner surface of the thigh, and in no instance were any harmful results noted following the puncture.

For a practical tuberculin test it has been found sufficient to have the temperature of the hogs taken every two hours from 8 a. m. to 6 p. m., inclusive, on the day of injection, and at the same hours on the day following, with the tuberculin injection made at 10 p. m. on the first day. The temperature before injection should be taken as frequently as after injection, and at corresponding hours, because of the very erratic character of the temperature of hogs and because of the slight circumstances that may inadvertently be the cause of marked variations. It should especially be borne in mind that the value of the results obtained depends entirely upon keeping the hogs absolutely quiet during the whole of the test, and this point may be more readily gained if the animals are kept in their crates for twelve hours at least before the first temperature is taken.

In reaching a decision as to the presence of tuberculosis in a hog, as shown by the temperature readings, it is somewhat unsafe to base a condemnation upon the comparison of the maximum reading before injection with the maximum of the day following, but by averaging the temperatures for each of the two days during which they have been taken one is enabled to reach very satisfactory conclusions by comparing these averages. It is essential that the temperatures should be taken at corresponding hours on each day of the test, if results are to be determined by means of averages. By this method it was found in a test experiment with 68 hogs that only two failures (less than 3 per cent) occurred. In these tests no hog was condemned as tuberculous until it had shown a persistent average elevation of temperature of 1° F. throughout the second day. In the two failures mentioned one tuberculous hog failed to react, and another animal gave a reaction, but at post-mortem examination no tubercular lesions could be found.

A report has been received from Doctor Luckey, State veterinarian of Missouri, which shows that hogs may be tested satisfactorily and to good advantage with tuberculin if handled quietly and kept so closely confined that no chasing or driving will be necessary at the time of taking temperatures.

As a proof that carefully bred pedigreed swine are not necessarily more susceptible to tuberculosis than the more common varieties, mention is made in the Veterinary Journal of the testing with tuberculin of a number of purebred animals intended for export to Finland. The temperature of each pig, which was numbered for identification, was carefully taken, the average for the boars being 39° C., and for the sows 39.16° C., the higher temperatures of the sows being thought to be due to excitement, owing to their racing about when let out of their pen. The temperatures of all of the pigs were higher at the preliminary reading than at subsequent testings, probably the result of being caught and handled.

The tuberculin was injected at 10 p. m., and the temperature of each pig was taken at 7 o'clock the following morning and each two hours afterwards until the veterinarian of the purchasing party was convinced that no trace of tuberculosis existed in any of the animals. The variations in the temperatures of the various pigs were comparatively slight, that of one boar being from 39.2° to 38.5° C., and of one sow from 39.4° to 38.5° C., the highest being in each case the one taken first. The average temperature of all the pigs at the various testings was 38.6425° C., or nearly 0.3° C. less than those first taken.

LESIONS.

The vitality of hogs or their powers of resistance to disease are necessarily lowered by the unnatural conditions which frequently obtain in hog raising, namely, the forced feeding for fattening and the small feeding pens in vogue in certain districts. When the enormous growth of a hog is considered, when it is realized that in the short space of eight or ten months its development is frequently 250 to 300 pounds—a proportionate increase of weight unknown to any other species of domestic animals—the great metabolic changes which must necessarily occur can be appreciated. Such rapid development is very likely to take place at the expense of the disease-resisting powers of the animal.

When tuberculosis results the lesions usually observed are discrete and of a chronic type, at times retrogressive and at other times slowly progressive, as manifested by calcareous deposits and fibrous encapsulation. It is not infrequent, however, that a more extensive and spreading disease is seen, and the lesions indicate a severe infection and rapid generalization of the bacilli, which in these animals may quickly follow the initial attack. And whether the disease assumes

an acute, subacute, or chronic type, tuberculous growths may soon be found attacking lymph glands in widely separated parts of the body. Indeed, a most extensive development of the disease has been reported by McFadyean in pigs from 8 to 10 weeks old, born of healthy parents and evidently infected by tuberculous skim milk. In these cases the lesions had not only undergone extensive caseous degeneration, but had even become partially calcified. Furthermore, he reported the observance of pigs 6 to 8 weeks old with generalized lesions which had become more or less calcified.

As soon as the tubercle bacillus invades the tissue changes develop, resulting in the formation of nodules or tubercles which may be either translucent or of a yellowish-white color. At first these tubercles are isolated and discrete, but later they may coalesce and form large areas of tuberculous tissue. Microscopically, the tubercle is formed of the same elements as are noted in the tubercles of other animals, namely, epithelioid, lymphoid, and giant cells. The earliest development of the tubercle consists of the invading bacilli surrounded by round cells. In a short time these cells are circumscribed by a layer of epithelioid and giant cells, which in turn are surrounded by a zone of lymphoid cells. As the tubercle grows the cells in the center of the tubercle die, become fragmented, and form a necrotic mass which enlarges as the tubercle increases in size. Sometimes these tubercles become indurated with fibrous tissue, or may go on to calcareous infiltration, or the necrotic areas may be surrounded by fibrous tissue elements, all of which cause the glands to be enlarged, hard, and knotty. These cases of calcareous infiltration in the hogs of this country are much more frequent than the Old World literature would lead one to believe occurs in European hogs.

One peculiar condition which is at times observed in tuberculous glands and which may prove perplexing to some inspectors is the arbor-vitæ or dendritic appearance which these lymph nodes may assume as a result of hyaline degeneration. This rather unusual form of a tuberculous gland probably arises from the lymph bringing to the node the tubercle bacilli, which, acting as an irritant, lead to the change, and which, being arrested in the nodes involved, permit the other tissues to escape unless further exposure follows. The delicate capsule and connective-tissue trabeculæ of these glands at first become excessively hypertrophied at the expense of the lymphoid elements. The tissue then partly or entirely undergoes a process of hyaline degeneration, making a tortuous, almost dendritic, course of this form of degeneration not unlike the branching of the arbor-vitæ of the cerebellum. Many of the lymphoid cells, particularly those in the vicinity of the connective-tissue septæ, suffer a similar fate. No necrotic areas have been observed, but isolated and clustered tubercle bacilli

may be seen in the earlier stages in the hyaline areas, which evidently retards the multiplication of the micro-organisms and brings about a partial process of healing, as in the more advanced stages tubercle bacilli can not be discovered either by the microscope or animal inoculations.

As a general rule, the lymph glands become enlarged, and caseation usually starts at several points where the tubercles had started, causing numerous small yellowish foci often surrounded by a reddened, inflamed zone. These areas are composed of degenerated gland substance, and are sometimes intermingled with pus; at other times they are of a cheesy consistency, and more frequently gritty through the deposit of calcareous particles.

The lesions, therefore, consist first of miliary granulations, which become caseous and which may rapidly become calcareous. Even in the absence of tubercle bacilli, the microscopic picture of stained sections shows the typical tubercular follicles almost always rich in giant cells. Furthermore, the insertion of a small piece of the susceptible tissue under the skin of a guinea pig will usually result in the production of the disease in three or four weeks, when the animal may be chloroformed and a diagnosis made.

As the disease is essentially produced by ingestion, the glands and tissues associated with the digestive tract are the most frequent seats of infection. Indeed, the superior cervical glands (in almost all cases the submaxillary gland) are nearly always affected, as at the post-mortem examinations held by Bureau inspectors over a consecutive period on 120,000 tuberculous hog carcasses, 93.3 per cent were found to contain lesions in these glands. The large tonsils and the large number of lymph sinuses in the lymph glands probably account for this great frequency. Next in importance are the bronchial glands, of which 27.2 per cent were diseased, while the gastro-hepatic chain of glands was involved in 21.6 per cent of the cases. In all these cases the lesions may involve the entire lymph structure, or only the central or several irregular points, and may be either caseous, calcareous, or caseo-calcareous. The mesenteric lymph glands showed lesions in 18.1 per cent of the carcasses examined. The liver was affected in 9.2 per cent of the cases, and showed either yellowish miliary foci, which were caseous and scattered, not only on the surface but also in the parenchyma, or the larger, irregular nodules, varying from a hemp seed to a shellbark in size. They are at times quite fibrous in consistency and may contain a caseous center, or calcification may occur as the disease advances and the alterations become more considerable. The lungs are the next tissue to be most frequently affected, as is represented by 7 per cent of the carcasses above recorded. The morbid anatomy of the lungs in this disease simulates

TUBERCULOUS LUNGS OF HOG.

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TUBERCULOUS AND NORMAL SPLEENS OF HOGS.

that observed in human tuberculosis more than in cattle tuberculosis. In fact, the disease bears many points of similarity to infantile tuberculosis in the human. There may be tuberculosis pneumonia involving large areas of the lungs, causing collapse of the marginal portion. There may be irregular-sized grayish or yellowish areas of caseation, as is so often seen in cattle; but not infrequently there are observed large numbers of miliary gray or translucent foci, showing evidence of generalization as a result of the bacilli being disseminated by the blood stream. (See Pl. II.)

The picture presented by tuberculosis of the spleen, which showed lesions in 3.8 per cent of the above carcasses, is very peculiar to one who is familiar only with cattle tuberculosis. The spleen is usually darker in color and the surface is quite rough and nodular, depending upon the number and size of the tubercles. Unlike the spleen of a tuberculous cow, these nodules occur not often on the serous membrane, but in the parenchyma. They vary from the size of a half pea to as large as a shellbark. The external pale or light-red nodules are raised above the surface of the organ and frequently show fibrous tissue bands radiating from the centrally necrotic area. (See Pl. III.)

The lesions observed in the mediastinal glands are similar to those in other glands and were noted in 1.8 per cent of the cases, while the sublumbar glands were found affected in 0.9 per cent of the carcasses. The serous membranes may show an eruption of tuberculous granulations, and these have been noted on the pleura in 0.1 per cent and on the peritoneum in 0.006 per cent of the cases. The generative organs are rarely affected. The bones, however, are more frequently attacked, those of the vertebral column, pelvis, and of the articulated extremities showing tubercular affection in 0.007 per cent of the carcasses. Tuberculosis of the muscles has been noted, but not so frequently as of the bones and joints. The lesions are usually rather limited to one region. Their aspect varies. They may be rounded, isolated nodes of the diameter of a pea or bean, composed of a fibrous capsule, with caseous contents. In other cases the muscles are sown with whitish-gray confluent tubercles, with centers that are usually calcified early in the development of the disease. The extreme rarity of lesions in the kidney is shown by the finding of but 3 cases in the 120,000 tuberculous carcasses. As examinations of the prepectoral, prescapular, and inguinal glands were not made in all instances, no percentages are given for them.

Occasionally also ulcers and tuberculous nodules are noticed on the mucosa or submucosa of the small intestines, especially of young pigs, but these likewise are rare, and when found usually accompany generalized lesions elsewhere in the body.

COMPARISON OF THE TUBERCULOUS LESIONS OF HOGS AND CATTLE.

While the lesions in hogs may be considered in their principal features like those in cattle, there are some points of difference which may be readily noted. As the disease in the former animals is essentially a food tuberculosis, the primary seat of infection is almost universally along the alimentary canal. The submaxillary glands are more frequently affected than any other tissue in hogs, while in cattle these are quite infrequently diseased. In fact, the submaxillary glands of hogs bear a somewhat similar position to the retropharyngeal glands of cattle, although the former are more frequently affected in hogs than the latter are in bovines. The lungs are less frequently diseased and generally secondarily involved, not primarily as in cattle. Furthermore, the pleura and the peritoneum are even less commonly affected than the lungs. The liver and the spleen, especially the latter, are more often diseased in hogs. The mammary glands of hogs are less frequently affected than in cattle, while the bones, joints, and muscles are more liable to disease in hogs. The lymph glands, even those remotely situated, are more frequently affected than in cattle (with the exception of the mediastinal gland, which is only occasionally diseased in hogs), and there is a very large percentage of this disease in hogs which only shows involvement of one, two, three, or even more groups of lymph glands without regular secondary infection.

Ulcers in the intestines, while infrequent in both species, are probably more commonly observed among swine. The formation of grape-like clusters on the parietal serous membranes is quite infrequent, and when it is seen it usually results from contact with an adjacent tuberculous organ. The lesions undergo calcification much earlier in hogs, and this form of degeneration occurs as often as, if not oftener than, in cattle, and frequently takes place when the lesions are quite small. The tubercle bacilli are quite elusive on microscopic examination, but are more readily seen in our experience with hog lesions than with bovine. Finally, unlike the disease in cattle, tuberculosis of hogs is most frequently seen at the abattoirs in animals under 1 year of age, due, of course, to the fact that the majority of hogs are marketed at this age.

RELATION OF HOG TUBERCULOSIS TO MEAT INSPECTION.

The post-mortem inspection of hogs by the Bureau officials is very thorough, and is so arranged that tuberculous carcasses are quickly separated from those that are healthy. The various phases through which the hog passes after his arrival at the stock yards, where he is yarded, sold, weighed, driven to the packing house, killed, scalded, and run through the scraper, do not particularly concern us until we

meet him at the point where, lying on the traveling table, his head is almost severed from the body. Here he is examined by a veterinary inspector of the Bureau, who palpates and, if necessary, incises the submaxillary glands which have been exposed by the cut just made by the butcher for removing the head. Should these glands prove to be healthy, the hog is allowed to pass down to the rail unmolested; if on the other hand these glands are seen to be tuberculous the animal is marked and is then run into a separate compartment called the retaining room, without being eviscerated. Most of the tuberculous animals are detected here at the header's bench, our records, as previously mentioned, showing that 93.3 per cent of the tuberculous hogs support lesions in the glands in the region of the throat.

From the header's bench the hogs which have not been tagged are sent along the rail to the gutter's bench, where another veterinary inspector is stationed, whose duties consist in examining each hog, giving special attention to the viscera. His search is not limited to the detection of tuberculosis, but he must watch for any of the diseases proscribed by the regulations of the Bureau. As there is a certain percentage of hogs that show tuberculosis in the visceral organs without giving any evidence of the same in the cervical glands, the inspector at the gutter's bench is able to detect a number of tuberculous subjects in addition to those already tagged by the veterinarian at the header's table. In this case the inspector is guided by the appearance of the lesions in the liver, spleen, lungs, or visceral glands.

Another inspector has recently been installed at the point on the line where the carcasses are split, it having been found that occasionally vertebral lesions and lesions of the serous membranes will exist, even when the visceral organs are apparently normal.

Returning to the hogs which were tagged by the inspector on the heading bench, these are passed along to the retaining room, where they are eviscerated by a separate lot of butchers, using separate tools, under the supervision of a fourth veterinary inspector. By this method the affected parts or tissues are prevented from coming in contact with the healthy meats and are passed directly from the retaining room to either the "condemned" room or to the offal tanks. In the retaining room by this time there will be many hogs on the rail that are only slightly affected with tuberculosis, and these are now beheaded, split, trimmed, and passed on to the cooling rooms.

It is not a very difficult problem to pass judgment on the carcass of a hog affected with tuberculosis when the lesions are slight on the one hand, or when they are widespread on the other. Most sanitarians are agreed to pass the former class for food, after removing the diseased parts, and to condemn the latter class. In the great majority of hogs retained by our inspectors the lesions are local, even

though one or more groups of organs are affected. It is not unusual to see hogs with lesions in the submaxillary, bronchial, and hepatic lymph glands, or any combination of them, in which the foci are of the same character, size, and consistence, and apparently of the same age, and in these cases the animals are judged to be infected by a limited exposure with resulting lesions in these various glands. Indeed, from experiments performed by the Bureau, where hogs were fed for two feedings on cultures of tubercle bacilli, it was observed that apparently some of the tubercle bacilli entered the submaxillary glands, while others lodged in the bronchial and hepatic glands at about the same time. These are purely primary lymphatic invasions, and these are the cases in which it is customary for the inspector to remove all diseased parts from the carcass and allow the remainder to be passed as suitable for food.

The principle governing such disposal of this class of carcasses is that, there being no evidence that the tubercle bacilli have been taken up from the portal of entry to the body by the blood vessels, there could have been no scattering of such organisms through the muscular parts of the carcass, and these may therefore be eaten with impunity. It is in cases of this class that danger from the development of toxins has been suggested. This, however, has been disproved by the experiments of Eber and ourselves.

The disposal of cases of generalized tuberculosis is likewise an easy matter, for it is evident that the infectious organisms have gained entrance to the blood vessels, and by this means have been conveyed to all parts of the carcass, infecting the meat more or less completely. The rendering of such carcasses in the offal tank is the only rational disposal that can be made of them.

There are, however, other cases in which the development of disease has reached a stage which may admit some discussion as to the advisability of using the meat for food. Many tuberculous hogs are found that give no evidence of cachexia or wasting, and that show on examination that the disease has not become generalized or extensive, although it has advanced beyond the point of primary glandular infection. Here the inspector must act carefully, trying to avoid the waste or loss of any meats that may be safely converted into human food, and at the same time being sure that nothing of a dangerous character is allowed to enter the cooling or cutting rooms.

If the lesions of tuberculosis in the animal under consideration are so located that they may be readily removed, a third method of disposing of the carcass may be selected. The carcass may be carefully trimmed, the tuberculous parts being consigned to the offal tank, while the trimmed meat, comprising the bulk of the edible portions of the animal, is placed in the lard-rendering tank, where it must be

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LUNG OF HOG WITH VERMINOUS PNEUMONIA.

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FAT NECROSIS INVOLVING (1) THE OMENTUM AND (2) THE PANCREAS OF HOG.

cooked by steam at a temperature not lower than 220° F. for not less than four hours for the extraction of the lard which it contains. This temperature, of course, is sufficient to destroy any bacilli that may possibly be present in the meat.

DIFFERENTIAL DIAGNOSIS.

There are but few diseases which are liable to be mistaken for tuberculosis in the hog, but under certain conditions verminous pneumonia, caseous lesions following an attack of swine plague, fat necrosis, pyemia, echinococcus cysts in the liver, or degenerations of the lymph glands caused by invasions of the young forms of the parasite known as *Lingulatula tænioides*, may cause lesions bearing considerable resemblance to those of tuberculosis.

In the lesions following swine plague it will be found that there is no involvement of the thoracic lymph glands, which practically always become affected with tuberculosis in all tubercular infections of the lungs. Mistakes between this disease and tuberculosis should not be made, as the lungs in cases of swine plague will not show the grayish areas simulating tubercles until the disease has run a protracted course, allowing the areas of the lungs to become caseated. Examination of the skin of the hog and the internal viscera will likely give evidences which will greatly aid in a differential diagnosis.

Cysts of the *Echinococcus multilocularis* in the liver may at times be confusing, but they are usually whiter in color than tubercular lesions of the same size, and when cut open the central contents of the cyst may be readily removed, which condition is totally unlike that to be found in tubercular nodules. In this affection the adjoining lymph glands are not changed as they are in cases of tuberculosis.

Invasion of the lungs of swine with strongyles or roundworms may produce lesions very similar at first glance to those of tuberculosis (see Pl. IV), but the adjacent lymph glands are not involved. Careful examination of the air tubes by opening them will readily disclose the worms to the naked eye, and thus establish the verminous origin of the lesions. It is said that the pseudo-tubercles which occur with this condition are in reality due to the encystment of the female worm or of the ova and embryos in the air sacs and cells. The long-necked tapeworm, *Cysticercus tenuicollis*, may invade the lungs and cause similar pneumonia, but this only rarely occurs. The finding of worms in the various visceral organs of the hog should serve to direct the attention to the air passages in cases of difficult diagnosis, as it is very common to find a verminous invasion of the lungs accompanying an invasion of the stomach or intestines.

Relative to the mistaking of lesions caused by the invasion of lingulatula larvæ into the lymph glands of hogs for lesions of tuberculosis, Edelmann gives the following:

The recognition of the larval site is not difficult if the affected areas and glands are cut open. They may be mistaken for tubercular areas if it is not recalled that—

1. Tubercular areas do not preferably occur in the peripheral zones of the lymph glands, but are usually found in their cortical portions.
2. Tubercular areas caseate from the center outward, and are surrounded by a gray peripheral layer, while lingulatula foci possess a uniform caseous consistency.
3. Caseous tubercular areas are yellow, while caseated lingulatula areas are greenish in color.
4. In beginning calcification tuberculous areas retain their yellow color; the pentastomum areas on the contrary turn gray; and
5. In lingulatula areas the larvæ or their hooks are demonstrable.

In pyemia the liver and lungs are the principal seats of the metastatic abscesses, which are soft and frequently encapsulated, but, unlike in tuberculosis, the corresponding lymph glands do not become caseated. Furthermore, there may be evidences of a general blood infection, as cloudy swellings of the organs, hemorrhages in the kidneys, lymph glands, and serous membranes, or a suppurative wound on the surface of the body through which the pyogenic micro-organisms entered.

Fat necrosis is generally considered to be the result of the fat-splitting ferment of the pancreas acting upon living adipose tissue. The fat is split up into fatty acid and glycerin by this ferment; the glycerin is absorbed and the fatty acid which is left combines with the salts to form a soap. The lesions occur in the form of dead-white, slightly raised, opaque, and grumous areas of variable size, and usually of a more or less circular outline. (See Pl. V, fig. 1.) They are of firmer consistence than the adjacent fat. In the majority of cases the lesions are confined to the immediate vicinity of the pancreas, and are found in the fat between the lobules and immediately surrounding the gland. (See Pl. V, fig. 2.) It is quite common, however, to find them considerably removed, and appearing in any part of the peritoneum, on the kidney fat, and even as far back as the pelvic cavity. The fat of the abdominal wall is frequently affected, and may contain many small areas from the size of a pinhead to that of a half dollar, or it may be so severely involved that very little normal fat will be found lining the abdominal wall. These patches may also occasionally appear under the parietal pleura and the parietal serous membrane of the pericardium. The lesions of fat necrosis are usually secondary to some alteration of the pancreas, while in tuberculosis the pancreas is very rarely involved, and then only in

conjunction with lesions in other viscera. Furthermore, the caseation so characteristic of tuberculosis is absent in fat necrosis.

PREVENTIVE MEASURES.

REMOVAL OF AFFECTED ANIMALS.

The first step to be taken in preventing the further spread of tuberculosis is to remove all affected animals, whether hogs or cattle, from the premises, as these will only serve as sources of infection so long as they are allowed to mingle with healthy animals. In dealing with affected herds of cattle it has been found best in most cases to apply the tuberculin test to the entire herd as a means of selecting the tuberculous animals, but with a drove of hogs in which tuberculosis has appeared there can be no doubt that the best and surest method of procedure will in nearly every case be found in the slaughter of the entire drove as soon as they can be put in a marketable condition. They should be slaughtered at an abattoir under Federal inspection, so that proper disposal may be made of affected carcasses.

This means of removing from the farm all of the centers of infection which exist among its swine is made possible and practicable by the ease with which a new drove may be built up from fresh foundation stock. With cattle the offspring seldom number more than one to a cow in a year, and the young cow does not produce until 2 years of age. With swine reproduction may be expected when the young sow is 1 year old, and instead of producing but one at a birth from six to ten may reasonably be expected. If properly handled, the first litter of young may be weaned in time to allow the sow to farrow again the same year. This shows how very rapidly a farm may be stocked with healthy swine after the total slaughter of a tuberculous lot. The early age at which the sow may be bred, her capacity for breeding twice a year, and the plural number of her offspring are forceful arguments for the total destruction of every diseased drove of hogs and the breeding up in clean, healthy quarters of a sound, healthy drove in its stead.

As tuberculosis seldom attacks the swine of a farm except through tuberculous cattle, the tuberculin test should be applied to all of the cattle on the place, and all tuberculous animals among them should be destroyed at the time of disposing of the hogs.

DISINFECTION.

With the hogs all removed from the place and no tuberculous cattle remaining, attention should next be given to disinfecting the premises, so that no center of infection may be left to contaminate future purchases of live stock. The disinfection of pens and stables may be accomplished by thoroughly cleaning them, scrubbing the floors with

hot water, brushing down all loose dust from the walls, and tearing out all woodwork which has become partly decayed. The interior of the pens or stables should then be carefully covered with a coating of lime wash containing 1 part of formalin to 30 parts of the lime wash, or 4 ounces of formalin to each gallon of the lime preparation. The yards should be carefully cleaned at the same time, especial attention being given to the removal of all rubbish and litter from the dark, shady corners. Lime, or a 3 per cent solution of carbolic acid, may then be sprinkled upon these dark portions of the yards. In all of the open portions of the yard the action of the direct rays of the sun will very quickly destroy all the virulence of the scattered tubercle bacilli.

The premises now being cleansed, healthy foundation stock may be procured, and if proper attention is given to keeping the cattle of the farm free from tuberculosis and to supplying the hogs with suitable food, the owner may feel every reasonable assurance that he has seen the last of tuberculosis among his swine. The trouble, time, and expense required will be more than repaid by the advantages gained.

It has been quite conclusively shown that swine acquire their infective tuberculous material from cattle, mankind, or poultry, but principally cattle.

Tuberculosis can not develop spontaneously in swine, but must be acquired from some outside source, and the farmer whose yards and stables have been thoroughly freed from the disease need fear no reappearance of the disease, except when introduced from some outside point of infection. In case the disease has only recently been introduced among the hogs it would be advisable to apply the tuberculin test that the affection may be detected in the early stages, in order that the hog raiser may clean up his herd with as little loss as possible.

PASTEURIZATION OF ALL MILK PRODUCTS USED FOR FEED.

The heating of all milk when received at public creameries to 176° F., or 80° C., has been found most effective in preventing the spread of tuberculosis to the animals consuming the by-products of such creameries. Denmark was one of the pioneers in this movement, having in 1898 passed a law requiring all skimmed milk and all buttermilk to be warmed to 185° F. before it could be distributed from any creamery to its patrons for feeding purposes. It was found, however, that this degree of heat was harmful to the product, and in 1904 the required temperature was reduced to 176° F., experiments having proved that no tubercle bacilli could withstand this amount of heat. In practically all of the Danish creameries from this latter date the whole milk has been heated to the required point,

thus assuring butter that is free from tubercular organisms, as well as by-products that are safe for use in feeding hogs or calves. The result of these regulations has been most satisfactory. The spread of tuberculosis to farms previously free, through the skimmed milk or the buttermilk from creameries, has been very markedly checked, and suppression of the disease in hogs has been plainly noticeable.

Treating of creamery milk as a cause of the spread of tuberculosis among hogs, Moussou makes the statement that sterilization of the by-products of creameries and cheese factories results in the disappearance of tuberculosis of an alimentary origin among the hogs fed with them, and the hog owners do not longer fear losses from this disease.

Borgeaud has cited an instance in which a serious outbreak of tuberculosis among hogs was overcome by boiling all of the separated milk before feeding it to the subsequent litters of young pigs.

PROPAGANDA AMONG FARMERS AND DAIRYMEN.

While pamphlets, popular articles, and public notices would be extremely useful in eradicating tuberculosis in swine, it would probably be more satisfactory to explain to the hog raiser by word of mouth the methods to be followed. As this suppression of tuberculosis is entirely voluntary on his part, a powerful propaganda is of the greatest value, and the veterinarian is the best equipped man available for the work. The State should also assist by employing veterinarians to give public lectures in towns and townships, as is being done at present in Sweden. We now have absolute knowledge that the vast majority of cases of hog tuberculosis are produced by—

1. Raw milk and slime from creameries.
2. Hand-separated milk from tuberculous cattle.
3. Feeding behind tuberculous cattle.
4. Feeding tuberculous carcasses.
5. Feeding slaughterhouse offal.

It therefore behooves veterinarians to educate their clients as to the proper methods of preventing this disease, as they would recommend a proper feeding ration or proper construction of a stable. Hog raisers should be instructed to (1) scald all raw products returned from the creamery; (2) to test their cattle if a hand separator is used on the farm, or in the absence of such a test, to scald the skimmed milk; (3) to let the hogs feed behind cattle only when the latter have withstood the tuberculin test; (4) to feed carcasses of animals that have died from any cause, or offal from the slaughterhouse, only after the meat and offal have been thoroughly cooked.

Sooner or later the packer and slaughterer are going to buy hogs subject to the post-mortem inspection, as they are at present doing in some of the large packing centers with certain classes of female

cattle; and the hog raiser who continues to fatten his hogs with tuberculous material should be made to sustain the losses arising from his lack of knowledge, skepticism, or indifference. The innocent purchaser, who can not be familiar with the methods of feeding in vogue on the farms of the different breeders, should not be expected to bear such losses, nor should the intelligent hog raiser who produces healthy hogs by carrying out minutely the known and proved methods of prevention be obliged to bear a portion of the burden caused by the careless or ignorant hog raiser, as is the case at present. To-day the hog buyer must make his purchases with the absolute knowledge that a certain proportion of his purchase will be condemned for tuberculosis, and as the post-mortem examination is the only key to the extent of the disease, the careful breeder must suffer equally with the careless one. This is not equitable. When the packer buys subject to the post-mortem results the intelligent hog raiser will get more for his healthy hogs than he does now, and the ignorant breeder will get less for his tuberculous hogs, which is as it should be.

It would be money well expended if butchers and packers who are losing so much from hog tuberculosis would employ veterinarians in their vicinity to write popular articles giving correct views on how to suppress tuberculosis on the farm and mail them to their hog shippers and hog raisers in furtherance of this plan of eradication. Extermination of hog tuberculosis is practicable, relatively easy, and should be attained without delay before the disease has gained too much headway.

One of the favorable steps in this direction, and one that will undoubtedly tend to check the advance of tuberculosis, is the enforcement of laws similar to the following, which have been enacted by the States of Iowa and Minnesota:

Laws of the thirty-first general assembly of Iowa (1906).

Be it enacted by the general assembly of the State of Iowa:

SECTION 1. That every owner, manager, or operator of a creamery shall before delivering to any person any skimmed milk cause the same to be pasteurized at a temperature of at least one hundred and eighty-five (185) degrees Fahrenheit.

SEC. 2. Whoever violates the provisions of this act shall, upon conviction, be liable to a fine of not less than twenty-five ($25) dollars nor more than one hundred ($100) dollars.

General laws of Minnesota for 1903, to prohibit and prevent the manufacture or sale of unhealthful or adulterated dairy products.

Be it enacted by the legislature of the State of Minnesota:

SECTION 10. That all creameries before delivering to any patron any skimmed or separated milk shall have pasteurized the same at a temperature of at least 180° F.

Similar laws to the above are at present being considered for Wisconsin and Illinois, but have not as yet been enacted.

EMBRYONAL ADENOSARCOMA OF THE KIDNEY IN SWINE.

By L. Enos Day, D. V. S.,
Veterinary Inspector in charge of Branch Pathological Laboratory, Chicago, Ill.

KIDNEY TUMORS OF MAN.

For many years certain mixed tumors of the kidney in the human being, owing to their peculiar histogenesis, have been a subject for discussion among pathologists and investigators. Grawitz [a] in 1883 separated from the great mass of sarcomatous and carcinomatous tumors, with which it had been classed for purely morphological reasons, that important group of tumors which spring from a matrix of misplaced adrenal tissue—the adrenal tumors of the kidney, or, as they are also called, hypernephromas. In 1894 Birch-Hirschfeld [b] described another, in another histogenetic group—the embryonal sarcomas of the kidneys, tumors which heretofore have been called by various names according as variations in their morphology were emphasized. The kinds of tumors of the group in question develop in early childhood and are comparatively rare. Their rapid growth, the resulting cachexia, and the formation of metastases give them the characteristics of true malignant tumors. There has been much difficulty in classifying these tumors. They are so heterologous in their histology that they have been described as sarcoma, carcinoma, rhabdomyosarcoma, sarcocarcinoma, adenomyosarcoma, adenosarcoma, adenocarcinoma, adenochondrosarcoma, and other compound names.

During the time which has elapsed since Birch-Hirschfeld published his paper with reference to these peculiar mixed tumors of embryonal origin, which he classified under the head of embryonal adenosarcoma of the kidney, a small literature has sprung up dealing with this new group of renal neoplasms; several cases have been described and interpreted from a different point of view. Herzog,[c]

[a] Grawitz, Paul. Die sogenannten lipome der niere. Virchow's Archiv für Pathologische Anatomie und Physiologie und für Klinische Medicin, bd. 93, hft. 1, p. 39–63. Berlin, July 2, 1883.

[b] Birch-Hirschfeld, F. V. Beiträge zur pathologischen anatomie der nierengeschwülste. Sarkomatöse drüsengeschwulst der niere im kindesalter (embryonales adenosarkom). Beiträge zur Pathologischen Anatomie und zur Allegemeinen Pathologie, bd. 24, hft. 2, p. 343–362. Jena, 1898.

[c] Herzog, Maximilian, and Lewis, Denslow. Embryonal renal adenosarcoma. American Journal of the Medical Sciences, v. 119, No. 6, p. 693–701. New York and Philadelphia, June, 1900.

who was the first to report a case of embryonal adenosarcoma of the kidney in man in the United States, has made an extensive study of three different cases and has contributed an article on the subject, going fully into the histology and histogenesis of these neoplasms.

KIDNEY TUMORS IN SWINE.

While these mixed tumors of early childhood are of extreme interest from a morphological point of view, it is also very interesting to know that they are not confined to the human being, but are found in the lower animals also, although the writer has been unable so far to find any literature dealing with their occurrence in the lower animals.

FIG. 32.—Embryonal adenosarcoma from an 8-months-old pig. Weight of specimen, 7½ pounds.

The writer's attention was first attracted to these new growths during the year 1899 while working in the hog-slaughtering department of one of the large packing establishments in Chicago. This case was condemned on ante-mortem examination. The animal was very thin and emaciated, and the outline of the growth could be made out through the abdominal wall by palpation. At that time sections were prepared for microscopical examination, but the true nature of the growth was not fully determined. This tumor was very large, weighing approximately 25 pounds. About a year later, while conducting post-mortem examinations on swine in a packing establishment in Iowa, the writer discovered another of these renal tumors, sections of which were prepared and a diagnosis of embryonal adenosarcoma made. Upon inquiry it has been learned that several of the

veterinary inspectors on the killing floors of some of the large packing plants of Chicago and Kansas City have observed renal tumors of various sizes and shapes in swine, but these tumors have not been examined microscopically.

Usually these neoplasms escape notice until the post-mortem examination is made. They appear as a large, encapsulated, irregular mass in the sublumbar region, extending perhaps from the diaphragm to the border of the pelvic cavity. Usually only one kidney is involved, but in some cases both are affected. When but one kidney is involved there is no predilection as to the side, the left kidney being

FIG. 33.—Microphotograph of an embryonal adenosarcoma of swine, showing general structure of tumor, including adenomatous and connective-tissue elements. × 26.

affected as often as the right, and vice versa. These growths are comparatively rare and occur only in young hogs up to eighteen months old. They grow very rapidly and may become very large. Recently one of these tumors weighing 60 pounds was observed by the writer in a Chicago abattoir.

The writer has never found such neoplasms in cattle or sheep and has no information that they have been observed in those animals by others.

Within eight months eight of these peculiar neoplasms have been received at this laboratory for microscopic examination. These new growths always develop inside of the kidney, usually beginning at or

near the pelvis, although in one case of the eight it was noted that the growth began in the medullary portion at the anterior end of the kidney. The renal parenchyma does not seem to take part in the proliferating neoplastic process, but becomes compressed by the growth, and atrophic. In some cases the kidney substance is so completely destroyed from pressure atrophy that it is impossible to make out any kidney tissue; in other cases there will be found a small portion of kidney tissue remaining in the form of a thin layer and fitting on the tumor mass like a cap.

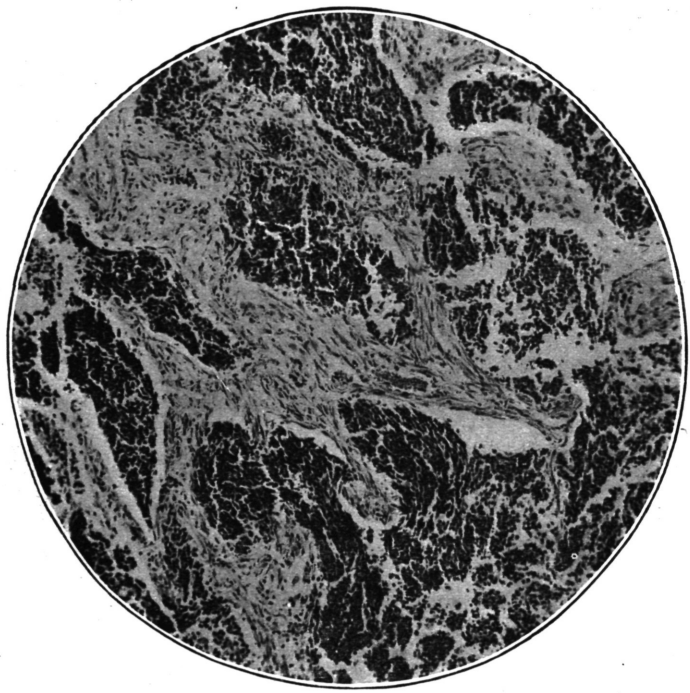

FIG. 34.—Embryonal adenosarcoma of swine, indicating metastasis into lungs. × 10.

In two of the cases metastasis had taken place—in one case into the lung (see fig. 34) and in the other into the sublumbar lymphatic glands. It is said that in children metastasis of these tumors takes place only after rupture of the neoplastic capsule. No rupture of the capsule was discovered in either of the above cases.

If one looks at these new growths in the mass they usually appear irregular in outline and have a thin, dense, fibrous capsule; in some places the capsule becomes so thin from internal pressure that it allows a portion of the tumor mass to project outward. These projections in some cases become, without rupture of the capsule, as large as a hen's egg. On cut sections bands of fibrous tissue seem to project from the capsule down into the tumor mass, which separates it into

indistinct lobules. In some cases there are cavernous spaces with polypoid growths of various sizes projecting into them; in other cases such proliferating masses will be found projecting into the partially obliterated pelvis.

The tumor substance is of a light gray color, mottled with hemorrhagic areas of different sizes and shapes. In the largest tumors necrotic areas of a yellowish color are noticed near the center of the growth. These tumors average 10 or 15 pounds in weight, although, as stated before, much heavier ones have been observed.

HISTOGENESIS.

Speaking now of the histogenesis of these mixed renal neoplasms, Birch-Hirschfeld points out in his paper on renal tumors, as quoted by Herzog, that the common histological feature of these growths is the fact that they represent a mixture of epithelial, adenomatous, and connective tissue elements, and that all of these are proliferating in a most extensive embryonal manner. Sometimes the character of an adenoma predominates, while the connective tissue elements are less prominent; at other times the opposite prevails. (See fig. 33.) These variable conditions are found not only in different tumors but in different parts of the same neoplasm. These tumors very frequently contain striated muscle fibers, which in some of the reported cases were present to such an extent that the new growths were designated rhabdomyoma or rhabdomyosarcoma. Birch-Hirschfeld believes that the embryonal renal adenosarcomata take their origin from remnants of the Wolffian body; he says that such an origin would explain the intimate relation between the tumor, the kidney, and the pelvis on the one hand, and the lack of a true blending between kidney substance and tumor tissue on the other. He also gives Eberth credit for having been the first to suggest this possibility with reference to embryonal tumors of the kidney containing epithelial elements. Eberth tried to explain the presence of striated muscle fibers upon the ground that the connective tissue of the Wolffian body was rich in embryonal muscle cells. This point, however, as Herzog says, is not well taken because this embryonal tissue which Eberth refers to gives rise to nonstriated but not to the striated muscle fibers.

Soon after Birch-Hirschfeld published his article there appeared another very important contribution on the subject by Wilms.[a] Herzog, in reviewing the ideas of these two writers on the histogenesis of these tumors, says—

> Birch-Hirschfeld traces the origin of these tumors back to embryonic inclusions derived from the Wolffian body. However, Wilms thinks that this attempt

[a] Wilms, M., Die Mischgeschwülste der Niere, hft. 1, Leipzig, 1899.

at explanation only accounts for the presence of epithelial elements; but the question remains unanswered. Whence arise the other heterologous elements, such as striated muscle fibers, cartilage, etc?

Again, Wilms in the same article disagrees with Birch-Hirschfeld's idea on the histogenesis of these tumors. He says—

If one discards the Wolffian body entirely and looks to the myotomes alone, one finds, indeed, the source of the striated muscle fibers and the cartilage, but not the origin of epithelial structure which these tumors contain.

In regard to the histogenesis of the epithelial tissue Wilms further says—

The epithelial glands in the tumor, according to our view, are not of primary origin, but they arise from certain cells of an embryonal tissue still undergoing differentiation. They arise from cells in which, in consequence of our inadequate means, we can not see future epithelial cells, but which appear first as small, round cells in an embryonic tissue.

The view which Wilms sets forth to explain the histogenesis of the epithelial structure of these new growths is not very strongly defended. It is not usually believed that small, round embryonal cells later on become epithelia. I consider Herzog's explanation on this subject clear and plausible. His words are—

To give our own views as to the histogenesis of these tumors it is necessary to enter very briefly into a discussion of the development of the myotomes ("Ursegmente") and of the Wolffian body ("Urniere"). These structures are developed from the early mesoderm which is first differentiated into the myotome and the lateral plate. Between these structures there is formed a thin bridge known as the nephrotome ("Mittleplatte"). In the latter the transverse excretory tubules of the Wolffian body, emptying later on into the Wolffian duct, are formed. While these tubules develop the nephrotome becomes entirely cut off from the myotomes. This is, in short, the normal course of events.

With reference to the embryonal renal adenosarcomata of childhood, we assume that they owe their origin to an inclusion which is formed in the following manner: The nephrotome is not cut off at the normal site, but in such a manner that a part of the myotome is severed from the main mass and remains in connection with the nephrotome. The separation may take place so that only a part of the myotome proper is cut off, or a part of the sclerotome may likewise be taken along. If the former is the case, we have the matrix for striated muscle fibers only; if the latter occurs, we have also the matrix for cartilage. If now we assume that a part of the nephrotome (Wolffian body) to which tissue of the myotome proper, or the latter and the sclerotome have become adherent by an abnormal process of embryonic separation, becomes included in the permanent kidney, we have a matrix containing all those embryonic elements which occur in these mixed renal tumors, namely, striated muscle fibers, and cartilage, other connective-tissue elements and epithelial glandular structures. The latter, of course, are derived from the excretory tubules of the nephrotome.

MICROSCOPICAL EXAMINATION.

Microscopical examination of sections of these tumors in swine show that they are composed of two types of tissue, epithelial structure and connective tissue elements. These two types of tissue are distributed through the tumor in such a manner that in some places a picture of a true epithelial neoplasm is seen, while in other areas the type of an embryonal connective tissue neoplasm is observed. In none of the sections was there found an intimate blending of the different types of tissue; on the contrary, each one seems to maintain its own type. This individuality of type is so strongly set forth that

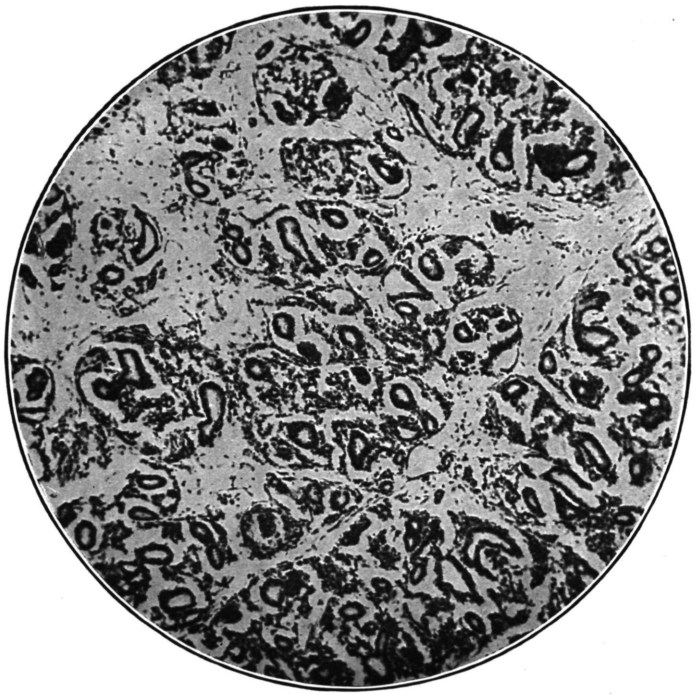

FIG. 35.—Embryonal adenosarcoma of swine, containing tubules which have the appearance of tubules in the Wolffian bodies. × 100.

one is at once impressed with the thought that the two kinds of tissue had originated quite separately. The epithelial element in most places arranges itself in the form of glandular structure, although in some places islands of epithelial cells are found lodged in the connective tissue without any definite arrangement. Again, such islands have glandular structure. The lumina of some of the larger tubules are filled with secretion from the lining epithelium and desquamated epithelial cells undergoing degeneration.

The lumina of the gland tubules are usually circular in outline and of various sizes; some are so small that one can scarcely dis-

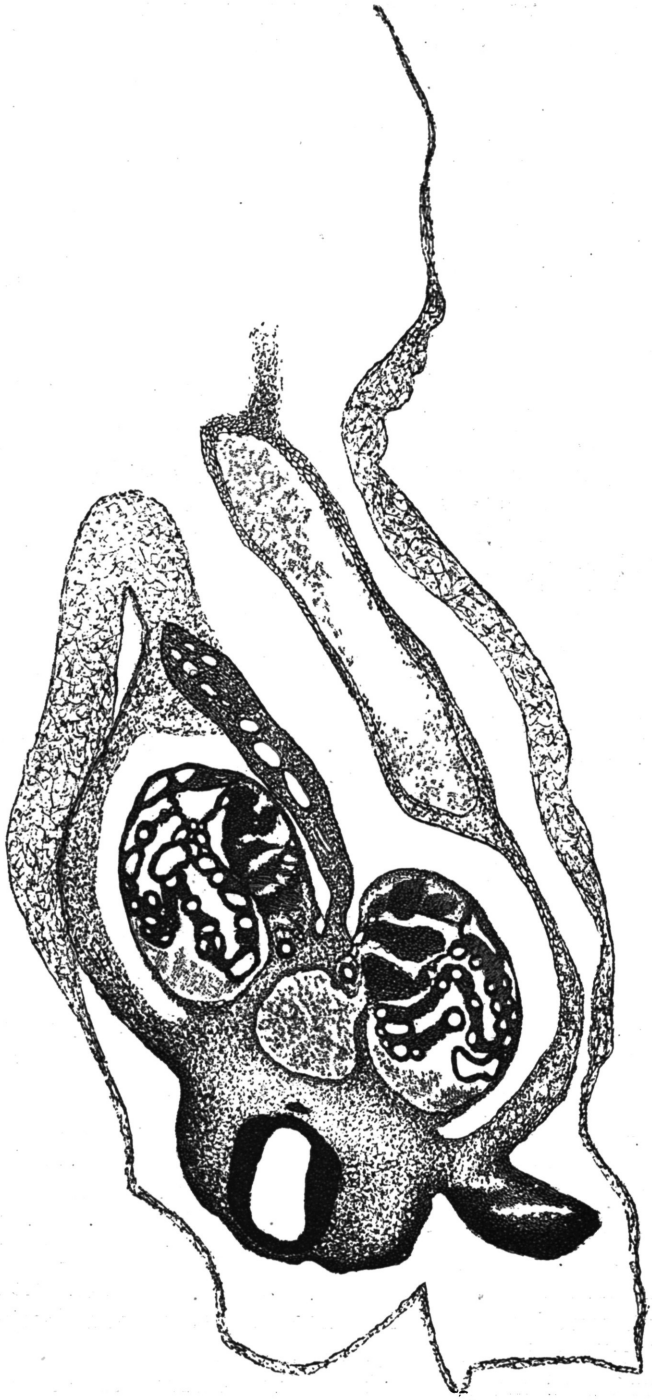

FIG. 36.—Pig embryo showing Wolffian bud. × 72. (Compare with tubules in fig. 35.)
(Drawing by W. S. D. Haines.)

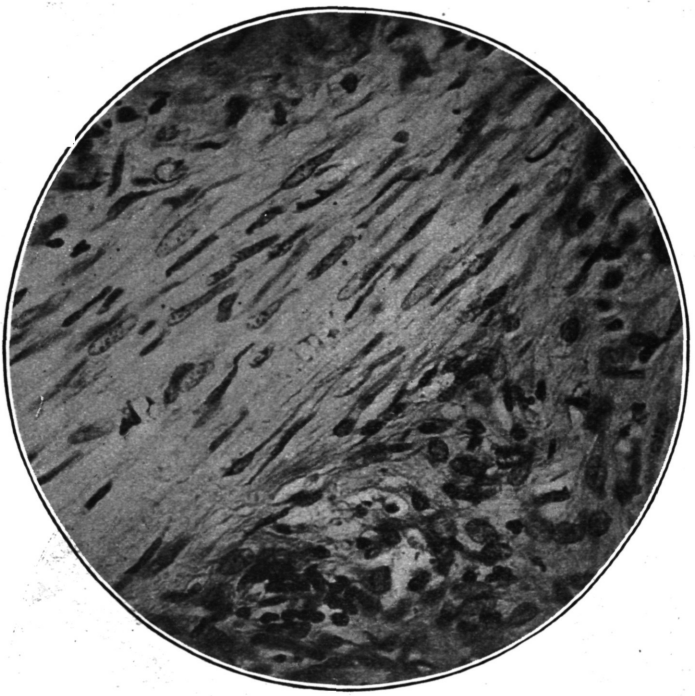

FIG. 37.—Embryonal adenosarcoma of swine, showing nonstriated muscle cells. × 400.

FIG. 38.—Embryonal adenosarcoma of swine, showing cartilage. × 210.

tinguish them, while others are three or four times larger than the normal tubule of the kidney. In addition to these lumina of the gland tubules there are also large alveolar spaces which are very irregular in outline. Desquamated epithelial cells undergoing degeneration are found in the lumina of many of the larger tubules.

The epithelial cells lining the tubules are quite embryonal in character and are arranged in a single layer. These cells usually contain a moderate amount of protoplasm; the nucleus is round and possesses a medium amount of finely granular chromatin. The epithelial cells lining the smaller tubules are round, somewhat larger than those lining the larger tubules; their nuclei do not contain quite

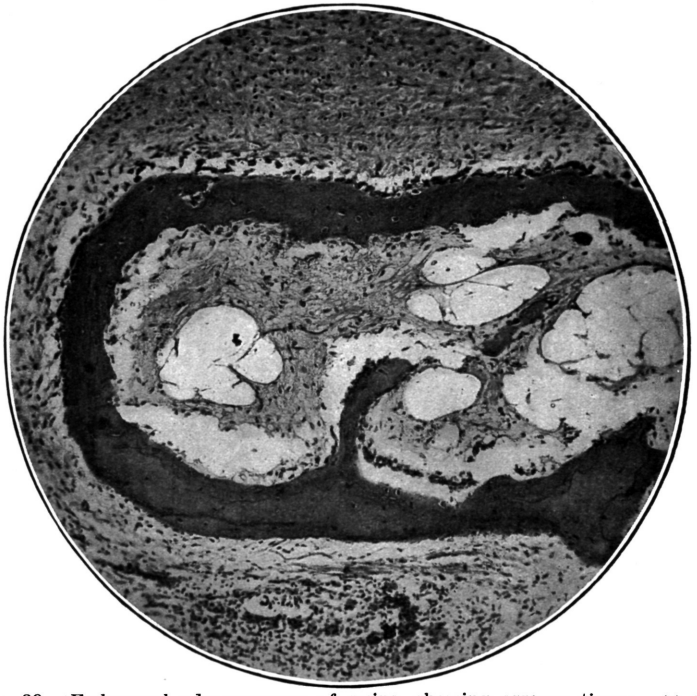

FIG. 39.—Embryonal adenosarcoma of swine, showing osseous tissue. × 100.

so much chromatin. The epithelial cells forming nests in the connective tissue are also round; the nuclei are vesicular and contain about the same amount of chromatin as those lining the small tubule.

If one compares the tumor cells as such and their arrangement where they form the tubular structures (see fig. 35) with the cells and the arrangement of the latter in the tubules of the Wolffian body in pig embryos 9 to 12 mm. long (see fig. 36), a striking similarity may be easily noticed.

The connective tissue is largely composed of fusiform cells with rod-shaped nuclei. These cells have very much the character of involuntary muscle cells. (See fig. 37.) The connective tissue just

described is distributed unevenly throughout the tumors. In some places there are hemorrhagic areas in the connective tissue.

Two of the tumors contained cartilage which was distributed here and there throughout the growth. (See fig. 38.) In one of the two a small amount of cartilage was found in the capsule.

One of the tumors contained a large amount of osseous tissue; this tissue was well developed and occupied a place near the center of the tumor. (See fig. 39.) A careful examination for striated muscle fibers was made of many sections from the eight tumors submitted, but none were found. In these respects only were these new growths different from those found in children.

55284—08——17

DERMAL MYCOSIS ASSOCIATED WITH SARCOPTIC MANGE IN HORSES.[a]

By A. D. MELVIN, D. V. S.,
Chief of the Bureau of Animal Industry,
AND
JOHN R. MOHLER, A. M., V. M. D.,
Chief of the Pathological Division.

INTRODUCTION.

While supervising the field work of the Bureau of Animal Industry in 1901 the attention of the senior writer of this paper was attracted to a peculiar skin disease among the horses on the Umatilla Indian Reservation, near Pendleton, Oreg. A preliminary examination of the scurf and hide of a number of infected horses indicated that the disease was somewhat dissimilar to any disease produced by animal parasites and suggested the possibility of the cause being of vegetable origin. This conclusion was reached owing to the generalized appearance of the lesions on the affected animals, the apparent short period of incubation, and the inability to find any mange parasites, even though many animals were inspected and the scabs scraped deeply, warmed, and examined by a good hand lens. That the disease was contagious was evident from the history of the outbreak and from the great number of animals found to be suffering with the affection in various stages of development. At that time about 6,000 horses were kept on the reservation, and it was estimated that over 2,500 of these animals were more or less affected with this cutaneous disease.

Owing to the interest attached to the determination of the true character, as well as with the hope of elucidating the causation of the disease and of suggesting appropriate treatment, portions of the hide from several badly affected animals were obtained and forwarded to the pathological laboratory at Washington for investigation.

PRELIMINARY INVESTIGATION.

An examination of the first samples of skin forwarded to Washington failed to show any animal parasites or any indication of their presence, such as the egg cases or eggs of a parasite or its gallery or

[a] This paper was presented at the annual convention of the American Veterinary Medical Association, Kansas City, Mo., September 10–13, 1907.

burrow. Both stained and unstained scrapings from the skin were examined at first and then sections of the tissue were prepared and studied. In each instance a large number of sickle-shaped spores of a fungus were observed, principally in the hair sacs, though occasionally in the sebaceous glands. Other specimens of skin were received from time to time, until about 30 samples in all had been forwarded. In all these specimens this identical fungus was found invariably, and in addition some of the hides showed the presence of the mange parasite *Sarcoptes scabei* var. *equi*, but they were not in sufficient numbers on any sample to account for all the lesions observed. In the majority of cases, however, only the fungus was present to account for the skin alterations, and an attempt to isolate this organism was thereupon made.

The hide was seared with a hot spatula and small cubes were removed with sterile forceps, smeared on potato medium, and then placed in a test tube containing bouillon. Potato and bouillon media were also inoculated direct from the seared surface of the skin by means of the platinum needle. Several of the remaining hairs on the hide were also used for making cultures by pulling them out with sterile forceps, snipping off the root end by means of sterile scissors and allowing them to fall into a tube containing potato or into melted agar, which was afterwards plated. The first successful culture was obtained on potato as a result of this last method of sowing the root of the hair upon this medium. Cover-glass preparations made from these various cultures showed the presence of a fungus containing numerous crescentic, sharp-pointed, segmented spores similar to those found in the microscopic sections of the skin and which were recognized as belonging to the group of fungi known as Fusarium. To this species of the fungus Nörgaard [a] has proposed the name *Fusarium equinum*, since up to that time no other species had been known to exist parasitically in or on horses.

In 1904 Sheldon [b] described the presence of a dry rot on corn caused by a fusarium called by him *Fusarium monoliforme*. This fungus was found by Peters [c] to be present on all the farms where a peculiar disease of animals was investigated. The horses would lose their hair and hoofs and were said by the stockmen in the community to be "alkalied." Cattle and hogs on these farms were likewise said to lose their hair and the chickens to lose their feathers, and Peters attributed it to the feeding upon moldy corn affected with *Fusarium monoliforme*. Feeding experiments conducted upon hogs with this corn, as well as with pure cultures obtained from the moldy corn, reproduced the symptoms in the experiment animals.

[a] Science, December 6, 1901, p. 898.
[b] Seventeenth Annual Report, Nebraska Agricultural Experiment Station, p. 23.
[c] Ibid., p. 13.

Bitting[a] describes the isolation of a fusarium from moldy corn which was incriminated in the production of forage poisoning of horses. A bacterium and another fungus were likewise isolated from the same moldy corn, but no appreciable results followed the feeding or inoculation experiments with these organisms nor the subcutaneous inoculation of an active growth of the fusarium. Corn meal inoculated with the fusarium and fed to horses, however, produced redness of the gums and some salivation. The moldy corn was then fed in its natural condition to two horses, but after the third day they could scarcely be induced to eat it. On the fifth day one of the horses had a slight salivation, occasional colicky pain, and diarrhea, and on the seventh day there were some incoordination of movement and stupor, but recovery followed without any skin manifestation. The result of Bitting's experiments shows that inoculation with cultures of the fusarium was infective, while the eating of mashes containing the fusarium in pure culture produced a stomatitis, and the feeding of the moldy corn itself caused a dietetic disturbance and some nervous symptoms.

Hart, working in the pathological laboratory of the Bureau of Animal Industry, has recently isolated from a peculiar skin lesion in a hog a culture of fusarium which conforms morphologically and culturally to the fungus here described. The carcass was one of a number of hogs killed in a local slaughterhouse, all of which showed the same condition of the skin of the belly. The specimen brought to the laboratory showed perfectly rounded patches, from a dime to a quarter of a dollar in size, with a hyperemic periphery and a dull gray center. The areas were sharply defined from the healthy skin and the condition was thought to be ringworm, the superficial dry crusts having been removed during the scalding and scraping process. Sections were made from the affected areas, but neither spores nor mycelia of either the trichophyton or fusarium were found in the tissue by this method of examination, although media inoculated with material obtained on a platinum needle after searing and incising the surface of a lesion produced a growth of fusarium.

HISTORY.

The dermatomycoses of the horses heretofore described have only included the three diseases produced, respectively, by the *Achorion schönleinii* (favus), *Trichophyton tonsurans* (ringworm), and *Microsporon adouini* (parasitic pityriasis), which Mégnin has described in the surface of the skin, in which the hair follicles showed a mass of mycelia and spores of this microsporon. To the nonprofessional

[a] Twelfth Annual Report, Indiana Agricultural Experiment Station, 1899, p. 44.

observer these various fungous diseases are grouped with most of the other skin affections under the general term of "mange," and the treatment of these widely different disorders is usually the same. The existence of another cryptogam as a parasite in the skin of the horse makes it of additional importance to understand thoroughly the character of these different cutaneous affections in order that the appropriate treatment of each may be recommended.

These three dermatomycoses are all produced by the lower fungi, consisting of simple filaments which develop budlike growths called conidia. The fusarium, however, belongs to the more highly organized fungi and is distinguished from the former by the possession of segmented mycelium and by the formation of spores in the interior of a specialized cell called an ascus. Contagion probably takes place as a result of actual contact with an affected animal, or by means of fences, posts, trees, stables, corrals, or by litter, grass, forage, etc., where the fungus is living saprophytically. The fact that the fusarium was leading a parasitic life on the skin of horses does not preclude its saprophytic origin from vegetable or inert matter where it may exist naturally, develop, reproduce, and contaminate the skin of the horses through contact with such infected vegetable or inert material. Indeed there are logical reasons for considering this method of infection the actual way of its spread, inasmuch as the actinomyces and aspergillus are known to live on vegetable matter, by which they are brought into contact with animal tissue which subsequently become parasitized by these fungi. Furthermore, fusarium fungi are known to produce the disease known as wilt on cowpeas, watermelons, tobacco, and cotton, and have also been found on corn, rye grass, and other forage crops, so that the possibility of the horses becoming directly infected by means of the vegetation affected with fusarium must be considered as a plausible possibility. Moreover, the fusarium is peculiarly an organism of the soil and its dissemination is widespread.

It is rather difficult to trace the history of this horse disease on the reservation or to determine the distribution of the affection in the adjacent country. It is supposed that a band of horses from California which were trailed through that section in 1892 brought the infection. Since then the disease has gradually increased yearly until it reached its height in 1901–2, when it was spreading so rapidly not only in the reservation but to adjoining districts in Oregon and Washington that the stockmen of that locality became very much alarmed and stated that unless the disease was eradicated all the horses of that section would become infected. This spreading of the disease was probably aided by the free movement of the Indians between the Umatilla Reservation and the various Washington res-

ervations, as well as by the custom of the Umatilla Indians of going on long hunting trips to the mountains each spring for fish and game.

SYMPTOMS AND LESIONS.

The presence of the *Sarcoptes scabei* in the skin of a number of the horses affected with this skin disease makes it difficult to determine what symptoms are caused by this animal parasite and what should be ascribed to the fungus. However, a number of hides were examined in which no sarcoptes could be found, and in those skins where sarcoptes were observed the lesions were out of all proportion to the small number of these parasites, while in all cases spores and mycelia of the fusarium were readily observed. Whether the sarcoptes offered an opportunity for the subsequent infestation with the fungus was impossible to determine, nor could it be ascertained whether the sarcoptic parasites themselves carried the fungus into the derm which later resulted in the appearance of the dermatomycosis.

From the microscopic examination of the early cases of this skin disease it would appear that the fungus enters the hair follicles, penetrates between the cells of the epidermis or an abrasion of the skin, and involves the surrounding cuticle, determining a greater or lesser degree of irritation. This is followed by pruritis, the animal attempting to rub itself against anything with which it may come in contact; it bites itself wherever it can reach, and enjoys being scratched with the fingers. It is not an infrequent sight to see two animals headed in opposite directions nibbling at the affected parts of one another. (See fig. 40.) The pruritis seems to be greater during the day than at night, and in the warm season than during cold weather. The hair in isolated areas appears to stand erect, and by passing the hand over the surrounding cuticle slight elevations are felt which are formed by a little scurf around two or three hairs. When this scurf is rubbed off by the finger nail there is left in its place a red, moist, denuded surface. In the early stages these areas are well scattered, but they increase in diameter and thickness and finally coalesce, forming large dry patches and thick crusts, from which the hair, after becoming brittle and broken, almost entirely disappears. (See fig. 41.) This condition spreads rapidly and affects almost the entire body except below the knees and hocks. In these cases the hair nearly all comes out and the tumefied skin will lay in wrinkles covered with crust or scabs, sometimes becoming fissured with superficial cracks. The crusts are of a gray color at first, but turn darker as they grow older and give off the usual odor of dead skin.

When the tissue is examined microscopically the spores are seen to be by far the more numerous, especially abundant in the hair follicle,

although mycelial threads are not infrequently observed. This results in changes in the hair follicle, followed by an atrophy of the papillæ and the dropping out of the hair. The true skin or derm, as the result of irritation consequent upon the presence of a foreign body, becomes thickened by a hypertrophy of the fibrous tissue elements, and the cuticle becomes harsh and unwieldy. The inflammatory process spreads to the sebaceous glands, causing a suppression of their excretion, with the resultant formation of epidermal crusts or scabs. Owing to the vast numbers of sensory nerve endings in the skin, there is much pruritis and more or less pain resulting from this hypertrophy of fibrous tissue and swelling of the skin.

FIG. 40.—Horses showing symptoms of the intense pruritis which accompanies dermal mycosis. One horse is rubbing against the hitching post, a second is biting himself, and the remaining two are nibbling at each other.

The fact that no sarcoptes were present in some specimens would indicate that the dermatitis was caused principally by the fungus, although undoubtedly the animal parasites may aggravate the disease to a considerable extent and make it more difficult to treat and eradicate. The few sarcoptic parasites found complicating the fungi were not in proportion to the extent of the lesions, and despite the fact that careful examination was made in all the specimens for scab mites, eggs, shells, or galleries, and that all the samples were warmed and kept under the best conditions for examination, the presence of the mite was only observed in a small percentage of the cases, and lice also

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SECTION OF HIDE OF HORSE SHOWING SPORES OF FUNGUS (FUSARIUM EQUINUM) IN HAIR FOLLICLES.

(Drawing made by camera lucida at stage level with No. 4 compensating ocular, and No. 8 objective; reduced two-fifths. Stained by Gram's method.)

were infrequently noticed, while the fungus was invariably found. That the fusarium was not existing as a simple saprophyte upon dead cuticle was manifested by the histological study of the skin after staining with borax blue and eosin, hematoxylin and eosin, Gram's, and similar stains, which showed that the fungus was deep seated and was acting as a foreign body invading normal tissue and producing irritation with consequent pruritis.

The exact point and mode of entrance of the fungus are not accurately known, but the spores and scanty mycelia are found in the hair

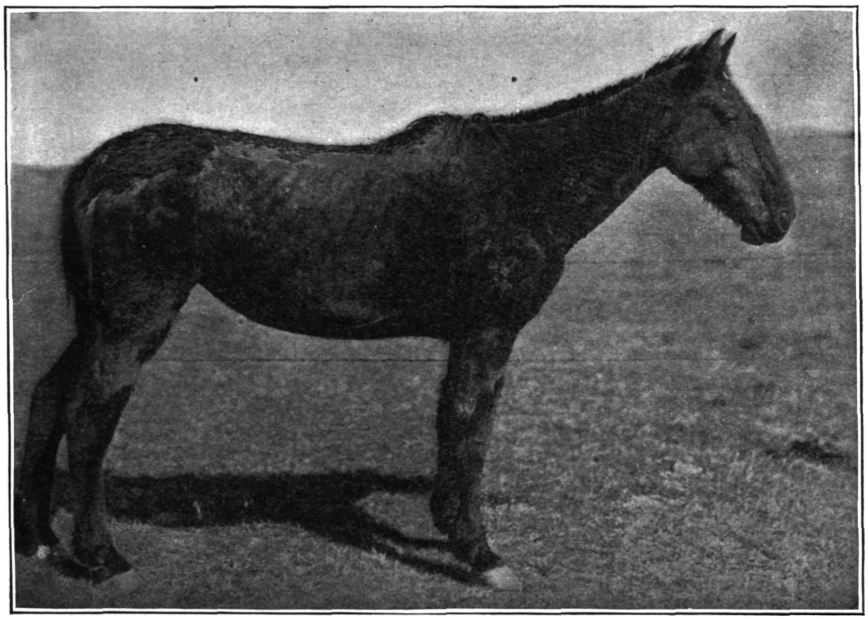

FIG. 41.—Mare showing characteristic lesions of dermal mycosis.

follicles, sebaceous glands, and in the scales on the surface of the skin. (See Pl. VI.) The secondary inflammation of the surrounding tissue is usually more severe than in sarcoptic mange, and is probably due to a toxin produced by the fungus. The lesions occur on various parts of the body, some on the neck, sides, external surface of the hind and fore legs, on the scrotal integument, and at times over all portions of the body except the lower parts of the legs. All ages and breeds of horses seem equally susceptible, as are both sexes, but there is considerable difference in the susceptibility of well and poorly nourished animals, since weak, impoverished, unclean, and neglected horses are more frequently attacked than horses in better condition. The animals stand around the rubbing post all day indifferent about eating, and finally become anemic and debilitated to such an extent that they die.

MORPHOLOGY OF THE FUNGUS.

With the view of studying the development and form of the fusarium, hanging-drop preparations were made with some spores suspended in a bouillon medium on a cover glass inverted over a cavity in a glass slide. Careful examinations of the preparations

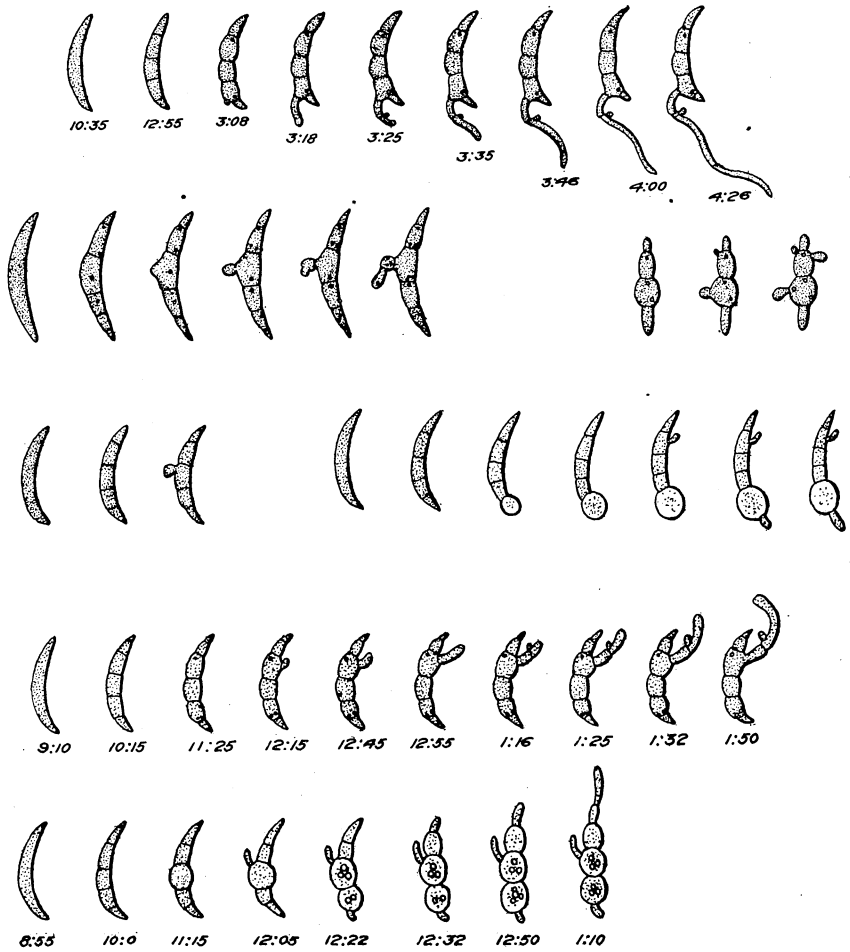

FIG. 42.—Germination of *Fusarium equinum* from macroconidia. Filaments are observed protruding from both terminal cells and intervening segments. The formation of septa is also noticeable in the mycelia. The numerals show the times (hours and minutes) at which the camera lucida drawings were made. (Drawings by W. S. D. Haines.)

were conducted for periods of five or six successive hours, and the various growths were reproduced by camera lucida drawings in the various stages of germination. (See fig. 42.) In from three to ten hours after transplanting the spores would commence to germinate, and the mycelia which grew rapidly would within twenty-four hours produce microconidia.

It might be well to mention at this time that the fusarium possesses three forms of spores or conidial fruits. One form is the microconidia, which are small, oval, nonseptate, colorless spores produced inside the living plant, either on aerial mycelia or on hyphæ which lie close to the substrata. They are mostly unicellular, but not infrequently consist of two cells and vary from 6 to 15 microns in length and 3 to 5 microns in width. The plasma of these conidia is very finely granular and is frequently vacuolated. The cell membrane is thin and hyaline.

The second form of spore is the macroconidia, which are large, falcate conidia with sharp lanceolated ends, three to five septate, the fruit being borne in great numbers on pure white or salmon-pink

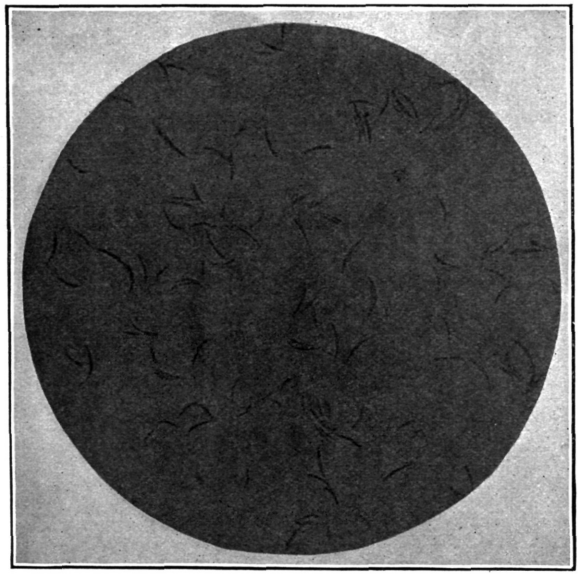

FIG. 43.—Photomicrograph of macroconidia from a 4-months-old culture of *Fusarium equinum* on potato, showing sickle-shaped, 3 to 5 septate spores.

colored conidia beds. The single cells between the septa are somewhat ventriculous, so that these conidia may appear slightly constricted at the dividing walls. The two end cells are about one and a half times as long as those in between. Contrary to the microconidia, these spores appear to form only on aerial mycelia and drop down immediately after separation. They are external, lunulate, sharp-pointed spores from 25 to 55 microns long and $2\frac{1}{2}$ to $4\frac{1}{2}$ microns wide. The establishment of the genus Fusarium is dependent upon the typical shape of this second fruit form. (See fig. 43.)

The third form of conidial fruit is the chlamydospores, which are oval or oblong, thin-walled, densely granular spores from 8 to 15 microns in diameter. Only a few of these spores were observed in

any of the cultures of the fungus, and then only in the older substrata.

Microconidia are produced during the most active growth of the fungus, while the falcate, multiple-celled spores are probably a resting stage and occur when the nutrition of the fungus is becoming diminished. Both of these forms of conidia produce mycelia in about the same length of time. The microconidia germinate frequently from both terminal cells, occasionally also from one of the intervening segments. Generally, however, only two of the cells germinate, rarely three, and the remaining cells retain for a long time their granular appearance. The mycelia usually grow rapidly in length and septa are formed in them. The filaments in some cases become quite long before spore formation begins, while in other cases the mycelia begin to fruit in a very little time, the filament as a result being quite short. Microconidia may in this manner be produced from mycelia germinating from macroconidia, or the reverse may take place.

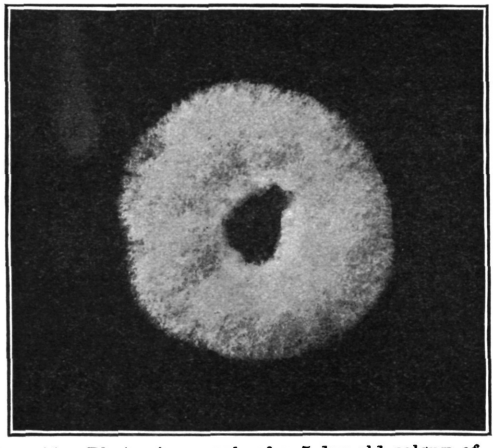

FIG. 44.—Photomicrograph of a 5-day-old colony of the fusarium on an agar plate.

By such methods of reproduction there is formed in three or four days upon the surface of culture media a white or slightly colored frost-like film composed of branching articulated filaments. (See fig. 44.) The crossing and ramifying hyphæ soon send up many colorless, vertical, vacuolate branches in which partitions or septa form at more or less regular intervals. (See fig. 45.) The cells thus formed are oblong and cylindrical, except the terminal one, which thickens and assumes an oval form. The partition which separates it from the other cells of the filament gradually causes its abstraction, and it readily falls off as a microconidium, to be followed by others, one after another. The spores then commence to germinate in a very short time by pushing out a germinating tube which first appears as a slight swelling following the polar accumulation of the cell plasma and the thinning of the cell membrane. The first protrusion of this germinating tube is noticeable in about five hours in the hanging drop. It may break out from any side of the spore, but usually develops at right angles to the long axis of the conidium. Sometimes two germinating tubes leave the same microconidium, which then soon be-

comes vacuolated. The segmentation and ramification of the young mycelial threads gradually follow, but require about twenty-four hours. The first septum is found close to the conidium, and the first ramification is likewise near to the basal end of the young filament. After the hypha end abstricts several conidia, it enters upon vegetative growth by elongation and formation of partitions, but later it may cease to vegetate and again form spores.

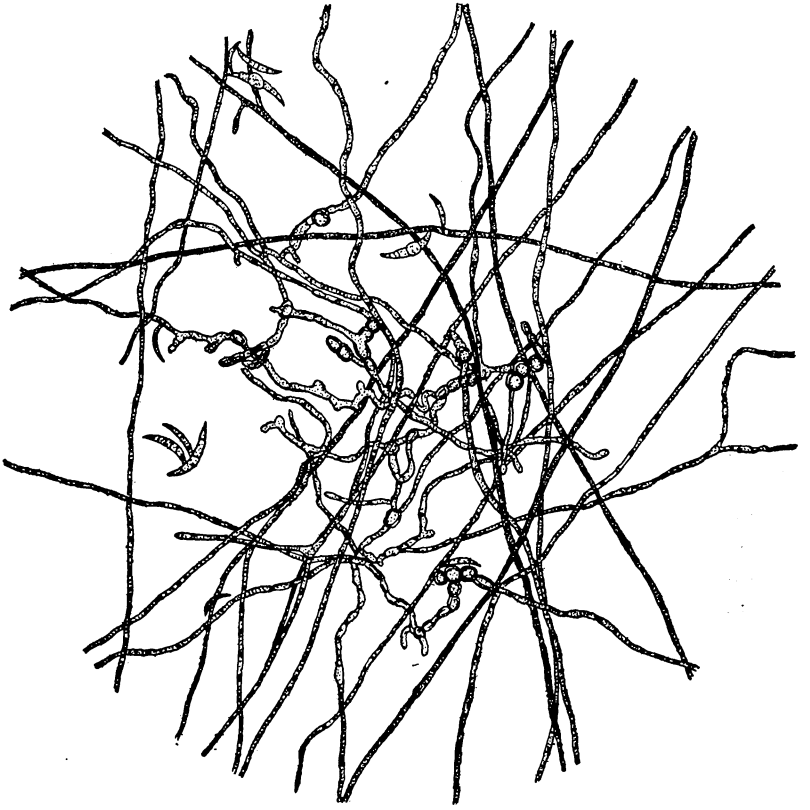

FIG. 45.—Conidia and mycelium of *Fusarium equinum* cultivated from root of hair of horse affected with dermal mycosis. (Camera lucida drawing made from agar culture 20 days old. Drawing by W. S. D. Haines.)

Perithecia were not observed on any of the culture media used, although numerous attempts were made to see if they could not be produced on various substrata.

CULTURAL CHARACTERISTICS OF THE FUNGUS.

In order to ascertain the characteristics and variability of growth of the fungus, a large assortment of substrata were used. On plain slant agar the growth is slight, spreads slowly, and remains in a thin layer over the surface of the slant.

In glucose and saccharose agar the growth is much more rapid and the stroma becomes wrinkled and dense after several days. The latter seems to be the more favorable medium, and the fungus takes hold quickly and spreads rapidly until the whole length of the slant is covered with a thick, wrinkled growth within four or five days after inoculation.

On plate agar the growth on the third day appears in the form of pure white colonies from 3 mm. to 1 cm. in diameter, with edges ciliated and the fine mycelia extending 3 or 4 mm. above the surface of the media. In the agar tubes the growths remained pure white on the surface as long as they were under observation (ten or twelve weeks), but the deep surface of the growth on plate agar, as well as in the slant agar tubes, became of a salmon-pink color.

On agar containing 2 c. c. of litmus solution and a few drops of saturated solution of sodium carbonate the spores failed to propagate, and after two weeks the medium became contaminated with Penicillium and was discarded.

On plain potato broth the growth was well marked at both the surface and in the depth of the media, and on agitation the deep growth scattered in the form of small flocculi through the liquid. Three tubes of potato broth containing 1 c. c. of a tenth normal solution of citric, tartaric, and oxalic acids, respectively, were also inoculated with the fungus, in all of which the growth was well marked, appearing at both the surface of the liquid and in the base of the tube. The outer face of the surface growth in all cases remained pure white, extending completely across the liquid and so compact that the tubes could be inverted and the liquid broth remain at the base of the tube, held in place by the compact moisture-proof mycelia. The inner face of the growth, or that part in contact with the underlying liquid, became of a dark brown or chocolate color about fourteen days after inoculation.

On Dunham's solution the growth was most marked, appearing at the surface and finally extending completely across the tube. About fourteen days after inoculation the fluid assumed a distinct yellowish cast, which increased until it became of a dark yellow and the surface of the growth near the medium assumed a dark chocolate color.

On Dunham's solution containing 2 per cent cane sugar and 1 per cent sodium carbonate solution four days elapsed after inoculation before any growth appeared. It then continued slowly to increase, and finally, after about eight weeks, had reached the surface of the liquid, which later had assumed a very light lemon-yellow color.

Two other Dunham's tubes, one containing 1 per cent oxalic acid and the other containing 1 per cent oxalic acid and 2 per cent cane sugar, were also inoculated at the same time. Seven days later, having shown no growth, they were reinoculated and incubated for

several weeks, but the fungus failed to multiply, and they were finally discarded after eight weeks of incubation.

The most favorable substrata used were potato and bread steamed in distilled water.

On potato the growth was unusually rapid, appearing in the form of a luxuriant, furlike, prominently raised growth, covering the potato slant in three or four days. Spore formation was extremely abundant in this medium, the characteristic crescent-shaped segmented spores appearing in enormous numbers about the fifth day after inoculation. After about ten days the entire surface of the potato was completely enveloped in the pure white growth.

On bread saturated with distilled water the growth was also very abundant and in five days had covered the surface of the medium. It continued to increase and became wrinkled. In ten days the bread had crumbled and sunk to the bottom of the tube, and the growth, being fully 12 mm. in thickness, floated on the surface of the water, which later assumed a yellowish cast.

On bouillon the growth was about the same as on the other liquid substrata. Growth appeared in the depth of the liquid and sent mycelial strands up the sides of the tubes for a distance of 25 mm. above the surface of the medium. The bouillon remained clear and there was no change of color.

The fusarium was also grown on acid and neutral gelatin in the form of stab cultures. The tubes were placed in the ice chest, and it grew equally well, but feebly, on the one as the other. The surface of the gelatin became covered with the fungus, and in five days arborescent spurlike growths appeared along the line of the stab in the form of isolated areas about the size of a pea in circumference. After about four weeks the gelatin began to liquefy directly under the surface growths and the liquefied portions assumed a light brown color. Liquefaction, however, was extremely slow, and after the cultures had been under observation for ten weeks it did not extend more than halfway down the stab.

A series of nine rice tubes were also inoculated with the fungus—(1) uncooked rice in distilled water; (2) rice containing 10 drops of 0.5 per cent hydrochloric acid solution; (3) rice containing 2 drops of saturated solution of sodium carbonate; (4) rice with 5 drops of 0.5 per cent solution of hydrochloric acid; (5) rice with 2 c. c. litmus and 2 drops saturated sodium carbonate solution; (6) rice with 5 c. c. saturated solution of sodium bicarbonate; (7) rice with 8 drops saturated solution sodium carbonate; (8) rice containing 2 c. c. litmus; and (9) rice plus 0.5 per cent hydrochloric acid solution sufficient to moisten the medium.

Of these nine tubes only the latter four showed any growth, and the remaining five were discarded after being kept in the incubator for

several weeks. Rice does not seem to be a favorable substrata, and the fungus remained dormant in these latter four tubes from fourteen to thirty days before any apparent growth was observed. However, after the fungus started in these tubes it grew steadily until two months after inoculation the surface of the rice in tubes Nos. 6 and 7 was covered with the white mycelia and it was boring its way down between the interstices of the rice grains. In No. 8 the aerial mycelia were pure white, but the growth below had assumed a beautiful purplish-pink coloration, while in No. 9 the substratum was of a reddish tinge which gradually faded to a pink on approaching the surface, which was white.

Blood serum also furnished a good nutritive medium for its growth. The slanted surface of the solidified serum became covered with a thin white growth within four days after inoculation. The action of the fungus on the serum substrata was peculiar. It produced a gradual softening of the serum, first affecting the slant which when the tubes were kept in a perpendicular position slid down until finally the growth was only separated from the side of the tube by the merest layer of serum. Finally all of the serum in the base of the tube showed the same softening, and if the tube were inverted the thus softened medium would slowly flow toward the mouth of the tube.

In order to ascertain the reaction of the cultures of the fungus grown for a varying number of days, three sets of bouillon tubes were inoculated. The reactions of these tubes were as follows:

Four tubes having a reaction of 0.6 alkaline to the phenolphthalein test; four tubes reaction 11.5 alkaline to the phenolphthalein test; four tubes reaction 0.3 acid to the phenolphthalein test.

After the lapse of forty-eight hours one of each set was titred. The 0.6 alkaline tube at this time had changed to 0.8 acid, showing that 1.4 per cent acid was produced in two days. The 11.5 alkaline tube had changed to 6.5 alkaline, and therefore 5 per cent acid must have been formed. The 0.3 acid tube had increased its acidity to 1.2 per cent, showing that 0.9 acid had been produced.

Four days after inoculation one more tube of each set was titred. At this time the reaction of the 0.6 alkaline had changed to 1 per cent acid, showing that 1.6 per cent acid had been produced in four days and 0.2 per cent acid in the last two days. The 11.5 alkaline tube now showed a reaction of 3.6 alkaline; therefore 7.9 per cent acid had been formed in four days and 2.9 per cent in the last two days. The 0.3 acid tube now showed a reaction of 0.88 per cent acid, and therefore 0.58 per cent acid had been produced in four days, but the acidity had been reduced 0.14 per cent in the last two days. The production of acid is therefore greatest during the first two days.

Six days after inoculation one more tube of each set was tested. The 0.3 acid tube now showed an acidity of 0.5, and therefore its

acidity seemed to be declining gradually. The 0.6 alkaline had changed to 0.5 acid, which indicated that its acidity was also gradually being reduced. The 11.5 alkaline tube now produced a reaction of 2 per cent alkaline, showing that this was the only tube in which acid production was continuing.

Twelve days after inoculation the last tube of each set was titred. At this time the 11.5 alkaline again gave a reaction of 2 per cent, which shows that it had remained stationary in reaction during the last six days. The 0.6 alkaline tube had a reaction of 0.33 alkaline, indicating that its acidity had been reduced during the last five days from 0.5 to 0.33 alkaline. The 0.3 acid tube at this time registered 0.55 alkaline, showing that its acidity had fallen from 0.5 to 0.55 alkaline in six days.

From the above experiments it will be seen that the fusarium produced acid rapidly during the first two days after inoculation. During the following two days acid production, although still continuing, was less marked than during the previous two days. At the end of six days the only tube still producing acid was the excessively alkaline one, in the remaining two the acidity being on the decrease. After this the 11.5 alkaline tube remained stationary, and by the eleventh day the acidity of the other two tubes had been very much decreased.

SUMMARY OF THE GROWTH OF FUSARIUM.

The growth of this fungus remained pure white on all media except plain Dunham's solution, where the lower surface of the growth next to the liquid was chocolate in color, but the portion of the growth projecting above the liquid was pure white; on agar, where during a part of the time the growth was of salmon-pink color, but later returned to white; and on litmus and acid rice, where the substrata became purplish-pink and reddish-pink, respectively. The fungus does not seem to grow at all, or at most grows very poorly, on Dunham's solution, especially Dunham's solution containing oxalic acid. On plain agar and on glucose and saccharose agar a growth was well marked, it being the most rapid on saccharose and least on plain agar. No appreciable difference was noted in rapidity of growth whether on 2 per cent or 10 per cent saccharose agar or 2 per cent or 10 per cent glucose agar. It can be easily grown on potato broth, and grows both on the surface of the fluid and in the depth. The growth continued to increase most steadily when on potato broth plus 1 c. c. of one-tenth normal solution of oxalic acid solution. Potato was an extremely favorable culture medium and growth remained pure white after two months. Bread was also a very satisfactory medium, and growth became very dense and wrinkled within a week after inoculation. Rice did not form such a good medium as those described

above. On this substance the fusarium may remain dormant for a very long time after inoculation and then suddenly start and grow exceedingly rapidly. One tube of rice made blue with 2 c. c. of litmus solution was inoculated on August 5. It remained in the incubator without any sign of growth until August 30, when it increased very rapidly, entirely covering the surface of the rice and extending for an inch down below the surface. The color of the growth was white on the surface, but became purplish-pink in the substrata. Another culture of rice, plus one-half per cent of hydrochloric acid, remained dormant from August 5 to August 18, when a slight growth could be observed. It increased very slowly until August 29, when it suddenly started, covering the whole surface of the rice, and extended below for a distance of an inch, producing a beautiful reddish-pink coloration of the substrata, which gradually faded to a pure white of the aerial mycelia. That this coloration of the hyphæ was due to the character and acidity of the medium was shown by transplants on potato, which resulted in the production of pure white colonies. When sown upon the slanted surface of solidified blood serum or in gelatin the peptonizing effects of the fungus became apparent through the liquefaction of both these varieties of culture media.

EXPERIMENTS ON TRANSMISSION.

After obtaining the fusarium in pure culture, attempts were made to infect guinea pigs and rabbits both by feeding the fungus and by rubbing pure cultures into the scarified surface of the epiderm after shaving the hair, but with negative results. Several rabbits were likewise exposed by cutting off the hair from the back, scarifying the derm, and sewing a piece of the diseased hide to the exposed surface, but without result. In fact, all our attempts in reproducing the disease were attended by the same negative findings. Dogs were fed the cultures and treated on and under the skin with the affected hide and cultures of the fungus, but without avail. As the most important experiments consist in the attempts to reproduce the disease in horses, a more detailed description of the methods employed will be given.

Three horses were used in this series of tests at various times during the investigation. Horse No. 1 was prepared by shaving several large areas on the back, on either side of the spine near the withers. The skin was disinfected with alcohol, carbolic acid, and sterile water, and then scarified quite extensively with a sterile scalpel. After the blood had been drawn from numerous punctures, cultures of the fusarium were rubbed into the skin. Twice daily a spray of sterile water was sprinkled over the surface to furnish sufficient moisture for mold development. When these attempts proved futile, similar areas were prepared, and the scabby surface of a sample of affected horse hide

was rubbed on the punctured skin and then fastened to the animal, but with the same result as before.

At a subsequent time horse No. 2 was prepared by treating the skin as for horse No. 1. Cultures of *Fusarium equinum* were thereupon rubbed into the parts and a large wad of absorbent cotton was placed over each treated surface and kept moistened by spraying with an atomizer at frequent intervals during the day. With this heat and moisture and an occasional addition of the fungus culture to the skin, it was thought that the most favorable conditions in nature were being met, but infection failed to take place.

Horse No. 3 was injected intravenously with 5 c. c. of a bouillon culture rich in spores, but from which the mycelia had been strained. The animal remained healthy. This horse was subsequently fed every day for ten days with the full growth of the fungus on a petri dish 100 mm. in diameter containing agar. These feedings were not effective in reproducing the disease, although the feeding experiments of hogs conducted by Peters with *Fusarium monoliforme* resulted in the animals losing their hair as in the original disease, while Bitting produced reddening of the gums, salivation, and intestinal disorder by feeding a similar fusarium to horses.

Thinking that probably the sarcoptes parasites might play an important rôle as carriers of the fungus, a small number (eight) were obtained from a Virginia horse and allowed to remain for several hours in a potato tube of the culture rich in spores. They were thereupon placed on the back of horse No. 3, but without producing a lesion of any kind.

It is very difficult to furnish an explanation for these various failures to reproduce the disease, especially to cause sarcoptic mange in the last experiment. The animals were all in good condition, well fed, and kept in a clean, sanitary stable without grooming. However, it is well known that some fungi require to be in a certain stage of development and to be placed in a particularly favorable environment before their pathogenic effects will be noticeable. No better illustration of this is required than the usual negative results which follow the inoculation experiments with the ray fungus, actinomyces. Moreover, similar negative results followed the inoculation experiments of Tokishige and Fermi and Aruch with the *Saccharomyces farciminosus*, the accepted cause of pseudo-farcy of horses. This failure to reproduce diseases with fungi which are known to be the causal factors may be due, according to the acceptation of some mycologists, to the use of only developmental forms of the fungus, so that perhaps the natural infection occurs not directly at this but at some later stage.

METHODS OF DISSEMINATION.

The extent of this contagious skin disease among the Indian horses on the Umatilla Reservation was only approximated. It was estimated that 4,000 horses were on the range, all of which were either affected or exposed, with possibly 50 per cent of the total diseased. Some of these were very aggravated cases; others only slight but gradually progressing. In addition there were about 2,000 horses used for riding or other work, which were kept up in corrals or small pastures, and of these only a few were affected, as they received greater care, and when they became infected were promptly and successfully treated.

As an illustration of the ways in which the disease is communicated to horses off the reservation and to the citizens' horses, it may be mentioned that the farming portion of the reservation is rented by white farmers, who usually have quite a large number of horses. In the winter and spring the Indian range horses come out of the foothills and graze along the roads and get into the fields on the reservation. The renters of the farms turn their horses out, and they are likewise liable to come in contact with the Indians' horses and use the same posts for rubbing and scratching themselves. Occasionally the white men's horses stray over on the reservation and become exposed. A portion of the south side of the reservation has been cut off, but this land has not been sold and is vacant Government land, as is also the case with considerable tracts of adjacent country. Hence the white men's horses run with some of the Indians' horses on this land. In several instances infected horses belonging to the Indians have wandered off the reservation into Pendleton, where they were taken to the city pound, thus exposing other horses. Furthermore, there is considerable trading between the whites and Indians, which has unquestionably resulted in the spread of the disease outside of the reservation, although to what extent has not been determined. One case has been reported in which the disease was brought into a valuable herd of 50 horses through the escape of one mare to the open range on the reservation, where she ran at large for a few days. Upon being caught and replaced with the band the disease broke out among practically all of them, and 30 horses succumbed to it.

It is stated that the disease has existed on the reservation since 1892, but that nothing was done to eradicate it until 1899, when the deputy State veterinarian slaughtered 1,000 or 1,200 affected horses on the reservation. Several years later about 500 of the diseased "scrubs" were sold to a fertilizing plant in Oregon.

Before medical treatment was undertaken to any great extent it was quite usual for ranchmen and others to shoot affected horses

when found upon the open range, or to drive them over cliffs. In this way many diseased horses were disposed of.

TREATMENT.

On the Umatilla Reservation the horses are divided, as has been previously referred to, into the riding or working class of animals, which are usually kept in corrals or on small pastures, and the unbroken horses which are allowed the privilege of the range. It was in this latter class of animals that the disease made such headway, as the Indians were quick to notice the beginning of the patches on their riding horses and immediately treated them. Kerosene was first used, but more satisfactory results were obtained with coal-tar dips, which finally replaced the former remedy. The Indians mix the disinfectant by guess and apply it cold by means of a swab.

When the Bureau undertook some experiments in treating this disease a dip was prepared, composed of a mixture of light dynamo oil and sulphur in proportion of 1 pound of the latter to 1 gallon of oil. The first experiment was unsatisfactory, as the rains and storms which immediately followed and continued for two months made a second application at the stated time impossible. Later this dip was used with good results. With the cooperation of the Interior Department, through their Indian agent, all the worthless, affected range horses which were found in the May round-up were killed by the Indian police. An inspector of the Bureau was present at the round-up, and those affected horses which were not slaughtered were immediately treated by him with the above described mixture. About 200 horses were rounded up in corrals each day, which made this work of eradication much more systematic than is usual under range conditions. Those affected animals which the Indians wished to keep were picked out, kept in a closed pasture, and treated until cured.

This method of handling the disease did not apply to the 2,000 riding or working horses, as these are always kept up, or are close by, and consequently what few cases became diseased were treated at once by the Indians, and as a result were generally cured. As a rule, they used coal-tar sheep dips, kerosene, or coal oil and lard, and while these remedies have not always been satisfactory, they produce cures in the majority of cases, especially the sheep dips. The Indians either roped and threw the horses and then applied the medicine or the animals were placed in a corral containing a chute in which they were confined while the remedy was being applied to them.

A STUDY OF THE METHODS OF CANNING MEATS, WITH REFERENCE TO THE PROPER DISPOSAL OF DEFECTIVE CANS.

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OBJECT OF INVESTIGATION.

In the canning of meat food products the cans are subjected to various processes, in the course of which they are inspected from time to time for leaks or defects in the tins. In spite of all precautions a certain number of defective or leaking cans are nearly always detected during the process of canning, and these cans, unless they be reprocessed, may constitute quite a loss to the packer. The regulations governing meat inspection permit the reprocessing of these defective cans, but require that this be done within a short interval after the original processing. This requirement is made in order to obviate all danger from the possible development of putrefactive changes within such cans as are to be reprocessed.

In the case of certain cans known as " slow leakers," where the defects or leaks are not detected as a rule until several days after the cans have been processed, the regulations require that the contents shall be condemned and tanked, or rendered into inedible fat and tankage. Prior to the issuance of the regulations, however, at one of the larger packing centers the question came up in connection with the canning of corned beef as to whether the contents of these slow-leaking cans might not be " worked over " with safety—that is, chopped or ground and mixed with other products of unquestioned soundness—and it was with a view to determining whether such a procedure should be allowed that the present investigation was undertaken.

To insure a better understanding of the experiments which were carried out in the course of the investigation it would seem desirable first to describe somewhat in detail the method of canning corned beef and also to define some of the terms used in the canning industry.

METHOD OF CANNING CORNED BEEF.

The fresh meat is first chilled, and then cut and boned, after which it is put in pickle for twenty-five to thirty days. After the meat has been properly cured it is removed from the pickling vats, placed in open kettles with sufficient water to cover it, and cooked for twenty

to forty-five minutes. The chief object of this preliminary cooking or parboiling is to secure the shrinkage, which always occurs on heating, before the meat is placed in the cans.

The meat is next trimmed, the gristle and superfluous fat being removed. After that it is run through a cutting machine and cut to the desired size, which varies for different-sized cans.

The meat is next fed into an automatic stuffing machine, the amount put into each can being roughly measured in a scoop. A small quantity of a liquid preparation known as "soup stock" is then added to each can. This soup stock, prepared by digesting fresh meat and bones, is simply a clear soup or consommé, and is added to fill up any spaces which may exist between the pieces of meat.

After it leaves the stuffing machine the can goes to a weigher, who weighs it and adds or takes off according to the weight. If the man who feeds the stuffing machine feeds in too much meat an "overstuffed" can results, and if too little meat is put in, as sometimes happens, the can is liable to collapse under the vacuum, giving rise to what is known as a "collapsed" can.

After the can has been weighed and any necessary correction made in the weight, the top is wiped and the cap put in place and soldered under a rotary soldering machine. The can is next inspected for cap leaks, and these are repaired by hand. The can then goes to the vacuum machine, where it is exhausted of air, and the vent is sealed while the can is in this machine and in a vacuum. If, as sometimes happens, the air in the can is not all exhausted, a "short-vacuum" can results.

From the vacuum machine the cans are run out on a table and again inspected for leaks. The inspector examines the vent and feels the can for loose tin, and all cans found to be defective are thrown out. All body, cap, and seam leaks in the defective cans are now repaired, the vents are opened, the cans are put back in the vacuum machine and the vents resealed under vacuum. If the can is a vent leaker it is not necessary, of course, to reopen the vent, and the can is simply replaced in the vacuum machine, the air exhausted, and the vent resealed.

The cans are next "processed" or heated to a sufficiently high temperature to insure the preservation of their contents. Two methods of processing are employed, known as the retort process and the water process.

In the retort method the cans are placed in strong iron or steel boilers, known as "retorts," which may be securely closed by means of bolts. In these retorts the cans are subjected to the action of steam under pressure. The temperature of the retorts varies from 215° to 250° F., and the cans are held in the retorts for varying lengths of

time, depending on the nature of the product and the size of the cans.

In the water process the cans are placed in large open kettles or tanks filled with water, which is maintained at the boiling point by means of steam pipes. The cans are kept in the boiling water for varying lengths of time, as in the retort method, depending upon the size of the can and the nature of the product.

After processing, the cans are placed in a spraying machine and sprayed with cold water. The cans are now inspected again, and all leakers found on this inspection are classed as "do-overs," which in some establishments are repaired and reprocessed.

The cans are next passed through the washing machine, where they are immersed for several minutes in a strong solution of sodium hydrate (caustic soda) in order to remove the fat and grease from the outside, and are then passed on through a bath of hot water to remove the alkali. They now undergo another inspection, the inspector tapping the end of each can with a small brass or wooden mallet. If the can emits a hollow sound it is thrown aside. All leakers found on this inspection are tanked. The cans are next painted and labeled. This part of the work is done by girls, who are quite expert in detecting leakers, so the cans really get another inspection while they are being painted and labeled.

The cans are now usually packed in cases and placed in stock. The men who do the packing, like the girls who do the labeling, are quite expert in detecting defective or leaking cans, so the cans undergo another inspection while they are being packed. The cases as a rule are not nailed up, and before shipment the cans are usually removed from the cases and given a final inspection before they are sent out on the market. The operations of painting, labeling, wrapping, and packing occupy several days, so that after the cans have been processed and washed it requires ordinarily from three to seven days to get them ready for shipment. The leakers which develop during this time are known as "slow leakers," and it is these cans with which we are especially concerned in the present investigation.

DEFINITION OF TERMS USED IN THE CANNING INDUSTRY.

Overstuffed can.—This is a can which has had too much meat forced into it by the stuffing machine, causing the can to bulge. Although the excess of meat is removed from these cans before they are capped and sealed, they do not regain normal shape, because the tin has been stretched and strained. These cans present a bulged appearance, usually on the sides near the top, and may resemble a swelled can, but the sides of the can are not tight as in a "sweller," and there is usually a little loose tin at the sides of the can. These cans

will not become " swellers " and their contents will remain good, provided the tin has not been broken by the extra strain to which it has been subjected.

Collapsed can.—This is a can which has collapsed or buckled in the vacuum machine because it was not properly filled—that is, because it did not receive a sufficient quantity of meat. If the tin is not broken these cans will not develop into " swellers " and the contents will remain good. They are discarded, however, because of their unsightly appearance.

Short-vacuum can.—A can which has not been completely exhausted of air is known as a short-vacuum can. Such a can shows a little loose tin, usually at the bottom. When this loose tin is pressed down with the fingers it either springs back into place of itself or it may be sprung back by squeezing the sides of the can. These cans will not develop into " swellers " and their contents will remain good, provided the processing was properly carried out and there are no defects or leaks in the tins.

Do-over can.—This is a defective can which is discovered after processing and before the can goes to the washing machine. In some establishments these cans are repaired and reprocessed or done over, hence the term " do-over " can.

Slow leaker.—A can which has a small leak through which the air gains entrance is called a slow leaker. The leak is often very hard to locate. It may be an opening the size of a hair in the solder filling the vent, or it may be a small opening in the solder holding the cap, the top, or the bottom. The leak may also be due to defects in the seam, the band, or the crimp, or it may be due to a bruise resulting from rough handling. If the top of the can is not properly wiped before the cap is put on a small particle of meat may project between the can and the cap and prevent the solder around the cap from taking hold at that point. Slow leaking cans always show loose tin, that is, the sides of these cans are not concaved and tight as in a normal can, because air has gained entrance and there is no longer a vacuum within the can. By squeezing the sides of these cans the contents may often be forced through the leaks, and this is one way of examining for slow leakers. Another way of testing for slow leakers is to place the can in hot water for a few minutes in order to dissolve the fat or gelatin which sometimes plugs the leak, and then by squeezing the can under water the air contained in the can may be made to bubble out through the water. Perhaps the best test for slow leakers, however, is to place the cans in a room heated to 100° to 110° F. and keep them there for a week or ten days, during which time all slow leakers should develop into " swellers." Even at ordinary room temperature a slow leaker will, after a time, usually develop into a sweller. Sometimes a slow leaker will swell sufficiently to open the leak and allow

the air and gases to escape, and if the leak does not become sealed by the contents of the can the gases formed in the interior will continue to escape and the can will not develop into a sweller; in this case, however, the contents of the can will be seen exuding through the leak or else may be forced through the leak by squeezing the sides of the can, and in this way the leak may be readily detected. As a rule, however, the leak becomes sealed by the contents of the can as a result of the solidification of the gelatin or fat, which prevents the escape of the air and gases, and the can develops into a sweller.

Sweller.—This is a can the contents of which have undergone fermentative or putrefactive changes resulting in the formation of gas which causes the can to swell or bulge. A swelled can is, as a rule, a further development of the slow leaker, as explained above. Swellers also sometimes occur where cans have not been properly processed, but this is a comparatively rare occurrence, as in most canning establishments the methods of processing are carefully watched.

LOCATION AND DESCRIPTION OF LEAKS.

Leaks may be located in the vent, in the cap, or in the body of the can.

Vent leaks.—These are leaks in the solder filling the vent. Oftentimes these leaks are very minute, no larger than a hair, and can only be detected by whittling away the solder with a knife; at other times, when the opening is larger, the contents may exude and solidify about the leak.

Cap leaks.—Leaks in the solder holding the cap are known as cap leaks. These are often due to small particles of meat projecting from the interior of the can, or to particles of meat left on the top of the can, which was not properly wiped before the cap was put on. The particles of meat prevent the solder from taking hold and a leak results.

Body leaks.—These are leaks in the body of the can. They may occur in the solder holding the top or bottom and may also occur in the seam, in the band, or in the crimp. They are designated according to their location as follows: (1) Top-float leaks, (2) bottom-float leaks, (3) seam leaks, (4) band leaks, (5) crimp leaks.

Body leaks are due to defects in manufacture, and on the books of a packing establishment, where a record is kept of all leaks, they are charged to the tin shop which supplies the cans. All vent and cap leaks result from faulty sealing of the cans, and are very properly charged to the canning room.

The location of the different leaks described above may be better understood, perhaps, by reference to the accompanying diagram (fig. 46).

After this rather cursory description of the terms and processes employed in canning, we may now pass on to a description of some experiments which were carried out in order to determine the effect of incubation upon the various types of cans just described and more especially upon slow-leaking cans.

EXPERIMENTS TO DETERMINE THE EFFECT OF INCUBATION UPON DEFECTIVE CANS.

These experiments were carried out at two of the leading packing establishments in one of the larger packing centers of the country. For the sake of convenience we may designate these establishments as X and Y.

EXPERIMENT I AT ESTABLISHMENT X.

For this experiment four lots of cans were selected as follows: Thirty-six slow leakers, 6 overstuffed cans, 6 short-vacuum cans, and 6 sound cans. The cans selected for this test were 2-pound corned-beef tins and were all taken from the same run.

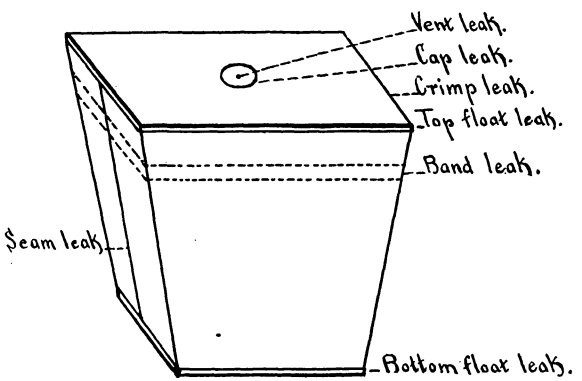

FIG. 46.—Diagram showing names and locations of leaks in corned-beef cans.

In carrying out the experiment the four lots of cans were placed in a hot room at establishment X. The room in which the cans were placed was a long, narrow room, beneath the kettles or tanks used for cooking the meat. The temperature, while not as constant as was desired, was yet sufficiently constant to answer the purposes of the test. The cans were examined each day for swellers, which were removed as soon as found and taken to the laboratory, where they were opened and the contents noted in each case. The cans were allowed to cool to ordinary room temperature (25° to 30° C.) before being opened. The temperature records of the hot room are Fahrenheit readings.

The results of the test were as follows:

First day: Cans placed in hot room at 4 p. m. Temperature of hot room at 4 p. m., 105°; at 5.30 p. m., 103°.

Second day: Temperature of hot room at 7 a. m., 100°; at 11 a. m., 102°; at 2 p. m., 106°; at 4.30 p. m., 105°. No swelled cans.

Third day: Temperature of hot room at 8.30 a. m., 89°; at 11 a. m., 89°; at 3.30 p. m., 87°. No swelled cans.

Fourth day: Temperature of hot room at 7 a. m., 84°; at 9.30 a. m., 104°; at 11 a. m., 107°; at 2 p. m., 109°. No cans distinctly swelled, but several show evidences of swelling.

Fifth day: Temperature of hot room at 7 a. m., 99°; at 11 a. m., 106°; at 2 p. m., 109°; at 5 p. m., 108°. Two slow leakers found distinctly swelled and taken to laboratory for examination. One of these cans was found to have a bruise leak and the other a bottom-crimp leak. The cans were opened and contents noted as follows:

Bruise leak.—Considerable amount of thin, watery, turbid fluid; meat toward bottom of can very dark and has a distinctly putrid odor; contents of upper half of can not so dark, but considerably darker than normal; putrid odor quite marked throughout; fat is soft, has a finely granular appearance, and is distinctly pale in color, lacking the bright yellow color of the fat in a normal can.

Bottom-crimp leak.—Considerable dirty-yellow fluid; distinct putrid odor throughout; meat very dark at top and bottom, better color toward center, but even there darker than normal; fat soft and pasty; interior of can shows evidence of corrosion and is quite rusty at bottom.

Sixth day: Temperature of hot room at 7 a. m., 100°; at 11 a. m., 105°; at 1 p. m., 100°; at 5.30 p. m., 96°. Two slow leakers found tightly swelled and taken to laboratory. One of these cans was found to have a vent leak and the other a top-float leak. The cans were opened and contents noted as follows:

Vent leak.—No fluid on opening can; can feels light in weight; distinct, sharp, pungent, or putrefactive odor (this is the odor that canning men describe as "putrid"); meat is dark throughout; interior of can shows evidences of corrosion.

Top-float leak.—Considerable thin, yellow fluid; heavy, dull, somewhat musty odor, which is quite different from the odor of a normal can (this is the odor which canning men describe as "sour"); interior of can distinctly corroded.

Seventh day: Temperature of hot room at 7 a. m., 100°; at 11 a. m., 102°; at 2 p. m., 105°; at 5 p. m., 110°. Four slow leakers found distinctly swelled and taken to the laboratory. Two of these cans showed top-float leaks, one a bottom-float leak, and one a vent leak.

Top-float leak No. 1.—No fluid; putrid odor; meat darker than normal throughout; fat soft and pasty; interior of can corroded.

Top-float leak No. 2.—No fluid; sour odor; meat darker than normal; fat soft and pasty; interior of can corroded.

Bottom-float leak.—Large quantity of thin, dirty-yellow fluid; pronounced sour odor; meat darker than normal throughout and falls apart readily; fat in semifluid condition; interior of can corroded.

Vent leak.—Considerable quantity of turbid, dirty-yellow fluid; strong putrid odor; meat dark throughout and falls apart readily; fat very soft, almost fluid; interior of can corroded.

Eighth day: Temperature of hot room at 7 a. m., 96°; at 11 a. m., 107°; at 2.30 p. m., 108°; at 5 p. m., 104°. Four slow leakers found swelled and taken to laboratory. Three of these were markedly swelled, the sides being distinctly bulged and tight. The fourth can

was swelled, but the sides were not so tight as in the other three. This can showed a cut in one of the vertical edges, and this cut had become sealed by the juices of the can. Two of the cans showed bottom-float leaks, one a vent leak, and the other a bruise leak. The cans were opened and contents noted as follows:

Bottom-float leak No. 1.—Considerable dirty-gray fluid; sour odor; meat very dark in color throughout; fat soft and pasty; interior of can corroded.

Bottom-float leak No. 2.—Considerable quantity of yellowish fluid; sour odor; meat is darker than normal at top and bottom, but has fairly good color toward center; fat shows evidences of breaking down and in places is soft and pasty; interior of can shows evidences of corrosion.

Vent leak.—Large amount of turbid, yellowish fluid; pronounced sour odor; meat dark throughout; fat soft and pasty; interior of can corroded.

Bruise leak.—Small amount of yellowish juice; pronounced putrid odor; meat dark throughout; fat broken down; interior of can corroded and badly rusted at top.

Ninth day: Temperature of hot room at 7 a. m., 82°; at 11 a. m., 83°; at 2 p. m. 86°; at 5.30 p. m., 90°. Three slow leakers found swelled and taken to laboratory. Two of these cans showed float leaks and the third a bruise leak. The first two were tightly swelled; the last showed a cut about one-fourth of an inch long in one side, through which the juice had exuded, and this can was not as tightly swelled as the first two. The cans were opened and contents noted, as follows:

Bottom-float leak.—Small amount of gray, turbid fluid; sour odor; meat dark throughout; fat soft and pasty; interior of can corroded.

Top-float leak.—Considerable thin, yellow fluid; sour odor; meat darker than normal at top, but of better color from the middle down; fat very soft, almost fluid; interior of can shows evidences of corrosion.

Bruise leak.—Small amount of dark gray fluid; distinct sour, somewhat rancid odor; meat quite dark throughout; fat soft and pasty; interior of can corroded.

Tenth day: Temperature of hot room at 8 a. m., 80°; at 11 a. m., 81°; at 2.30 p. m., 81°. This being Sunday, no cans were taken out for examination.

Eleventh day: Temperature of hot room at 7 a. m., 81°; at 11 a. m., 81°; at 2.30 p. m., 82°; at 5 p. m., 82°. Six slow leakers were found distinctly swelled and taken to laboratory for examination. The leaks and condition of contents were as follows:

Bottom-float leak No. 1.—Considerable turbid, gray juice; distinct sour odor; meat dark throughout; fat soft and pasty; interior of can corroded.

Bottom-float leak No. 2.—Considerable dirty-yellow fluid; sour odor; meat quite dark throughout; fat very soft, almost fluid; interior of can shows marked corrosion.

Top-float leak.—Small amount of dirty-gray fluid; distinct sour odor; meat very dark at top; color better toward bottom; fat soft and pasty; interior of can corroded.

Cap leak.—Small amount of yellowish fluid; sour odor; meat shows fairly good red color, but is somewhat darker than normal; fat shows fairly good yellow color and is fairly firm; interior of can shows evidences of corrosion.

Bruise leak.—Small amount of yellowish fluid; distinct sour odor; meat very dark throughout; fat almost completely broken down; interior of can much corroded.

Leak not located.—Small amount of thick yellowish fluid; distinct sour odor; meat shows good red color; fat fairly firm and of a good yellow color; interior of can slightly corroded.

The original plan was to conclude the test at the end of ten days, but in view of the fact that the temperature of the hot room fell quite low, scarcely above ordinary room temperature on the last three days, it was decided to continue the test three days longer.

Twelfth day: Temperature of hot room at 7 a. m., 81°; at 11 a. m., 110°; at 2.30 p. m., 106°; at 5 p. m., 101°. Four slow leakers were found swelled and taken to the laboratory. Three of the cans showed float leaks, and in one the leak could not be located. The cans were opened and contents noted as follows:

Bottom-float leak No. 1.—No fluid; sour odor; meat very dark throughout; fat soft and pasty, almost white, having lost its original yellow color; interior of can much corroded.

Bottom-float leak No. 2.—Considerable dirty-gray fluid; distinct sour odor; fat has lost yellow color and is almost completely broken down; interior of can shows evidences of corrosion.

Bottom-float leak No. 3.—Considerable dirty-yellow fluid; sour odor; meat dark throughout; fat very soft, almost fluid; interior of can much corroded.

Leak not located.—No fluid; distinct putrefactive odor; fat almost white, and soft and pasty; meat quite dark; interior of can much corroded.

Thirteenth day: Temperature of hot room at 7 a. m., 82°; at 11 a. m., 81°; at 2 p. m., 82°; at 5.30 p. m., 127°. Two slow leakers found swelled and taken to laboratory. One of the cans showed a cap leak and the other a float leak.

Cap leak.—The meat is quite dark in color at top and the fat at top is broken down and almost white; the color of the meat is better toward the bottom of the can; sour odor; interior of the can much corroded.

Bottom-float leak.—Considerable turbid, yellowish fluid; sour odor; meat darker than normal throughout; fat soft and pasty; interior of can shows evidences of corrosion.

Fourteenth day: Temperature of hot room at 7 a. m., 122°; at 10.30 a. m., 117°. The nine remaining slow leakers were taken out on this date. Five were tightly swelled, literally as tight as drums, and the other four were distinctly swelled, but not so tightly. The leaks in these cans were located as follows: Three cap leaks, three float leaks, one vent leak, and two bruise leaks.

Cap leak No. 1.—Small amount of dirty-gray fluid; distinctly putrid odor; meat has fairly good color throughout, but is soft and mushy; fat very soft and pasty, but has not entirely lost its yellow color; interior of can much corroded.

Cap leak No. 2.—Considerable amount of dirty-yellow fluid; sour odor; meat

has fairly good red color, but is somewhat darker than normal; interior of can shows evidences of corrosion.

Cap leak No. 3.—Considerable dirty-yellow fluid; sour odor; meat darker than normal; fat pale and soft; interior of can shows marked corrosion.

Top-float leak No. 1.—No fluid; sour odor; meat has fairly good color, but is darker than normal; fat soft and pasty but still shows fairly good yellow color; interior of can badly corroded.

Top-float leak No. 2.—Same as top-float leak No. 1.

Bottom-float leak.—Considerable quantity of dirty-gray fluid; sour odor; meat dark throughout; fat soft and pasty; interior of can much corroded.

Vent leak.—Large quantity of thin, dirty-yellow fluid; distinctly putrid odor; meat darker than normal; fat soft and pasty; interior of can much corroded.

Bruise leak No. 1.—Some dirty-gray fluid on opening can; distinctly putrid odor; meat dark throughout; fat broken down and almost white; interior of can much corroded.

Bruise leak No. 2.—Same as bruise leak No. 1.

Lots Nos. 2, 3, and 4, consisting of overstuffed, short-vacuum, and sound cans, were all removed from the hot room at the end of thirteen days. None of these cans showed any evidence of swelling, but in order to complete the test they were taken to the laboratory and opened and the contents noted as follows:

Lot No. 2. Six overstuffed cans.—The contents of these cans, which were kept in the hot room the same length of time as the slow-leaking cans, were found to be perfectly normal. On opening the cans the following conditions were noted: Small amount of yellow juice; odor that of normal corned beef; meat has a good bright-red color throughout; fat firm and of a good bright yellow color; the meat holds together well and when the can is inverted the contents turn out and retain the shape of the can; interior of cans bright, with no evidence of corrosion.

Lot No. 3. Six short-vacuum cans.—These cans were kept in the hot room for the same length of time as the slow-leaking cans and when opened the contents were found to be perfectly normal.

Lot No. 4. Six sound cans.—These cans were incubated for the same length of time as the preceding lots and when opened their contents were found to be sound in every respect.

TABLE 1.—*Results of Experiment I.*

Number of days in hot room.	Temperature of hot room.	Swelled cans.			
		Slow leakers.	Overstuffed cans.	Short-vacuum cans.	Sound cans.
	° *F.*	*Number.*	*Number.*	*Number.*	*Number.*
0	103–105	0	0	0	0
1	100–106	0	0	0	0
2	87–89	0	0	0	0
3	84–109	0	0	0	0
4	99–109	2	0	0	0
5	96–105	2	0	0	0
6	100–110	4	0	0	0
7	96–108	4	0	0	0
8	82–90	3	0	0	0
9	80–81	0	0	0	0
10	81–82	6	0	0	0
11	81–110	4	0	0	0
12	81–82	2	0	0	0
13	117–122	9	0	0	0
Total		36	0	0	0

From the preceding table it will be seen that all the cans that swelled were slow leakers, and of these the entire number, 36, became affected. None of the overstuffed, short-vacuum, or sound cans swelled.

Besides the formation of gas and consequent swelling, the slow-leaking cans in the foregoing test showed in every instance further evidences of putrefactive changes, viz, sour odor, darkening of the meat, breaking down of the fat, etc., and the interiors of the cans in every instance showed evidences of corrosion.

The leaks in the 36 slow-leaking cans were located as follows:

	Cans.	Per cent.
Float leaks	18	50.00
Bruise leaks	6	16.66
Cap leaks	5	13.88
Vent leaks	4	11.11
Crimp leaks	1	2.77
Not located	2	5.55

The fact that no swellers developed among the sound (i. e., normal) cans would indicate that there was nothing wrong with the process to which this particular run of cans was subjected, and this is further borne out by the fact that in the lot of cans classed as slow leakers the leaks could be detected in all but two instances. The large number of swellers which developed in the course of this test must therefore be attributed to defective tins and to faulty sealing and not to defective methods of processing. From the fact that an unusually large proportion of slow-leaking and swelled cans was detected by the Government inspectors in this run of cans it would appear that in this particular run there was an unusually large percentage of defective tins. In other words, the fault lay with the tin shop which supplied the tins and with the sealing thereof, and not with the method of processing.

Experiment II at Establishment Y.

As a check on Experiment I and in order to determine whether the same results would be obtained at another plant with the product prepared by a different firm, a second test was carried out at establishment Y, using cans of the same size and of the same product as were used in the first experiment at establishment X.

For this test the following cans were selected: Eleven slow leakers, 5 short-vacuum cans, 1 overstuffed can, 1 collapsed can, and 7 sound cans. As in the first experiment the cans selected were 2-pound cans of corned beef and were all taken from the same run.

In carrying out the test the cans were placed in a small room lined with metal shelves and used by the establishment as a test room. This room is held at a constant temperature of approximately 100° to 110° F., and in it are placed sample lots, six cans each, of every run of canned goods. The cans are held in the test room for ten days or two weeks, sometimes longer, as a test on the process to which they have been subjected. If a large proportion of the cans in a given lot should swell, it would indicate that there was something wrong with the processing which they had received.

The results of the test were as follows:

First day: Cans placed in test room at 12 o'clock noon. Temperature of test room at 12.15 p. m., 105°; at 3 p. m., 109°; at 5.30 p. m., 110°.

Second day: Temperature of test room at 7.30 a. m., 110°; at 12.30 p. m., 107°; at 2.30 p. m., 109°. No swelled cans.

Third day: Temperature of test room at 7 a. m., 114°; at 1 p. m., 112°; at 5 p. m., 114°. No swelled cans.

Fourth day: Temperature of test room at 7 a. m., 108°; at 12 m., 112°; at 5.30 p. m., 112°. Several slow leakers show evidences of swelling.

Fifth day: Temperature of test room at 7 a. m., 112°; at 9.30 a. m., 112°; at 4 p. m., 110°. Three slow leakers were found swelled and taken to the laboratory for examination. One of these cans showed a float leak, one a cap leak, and the other a vent leak. The cans were opened and contents noted as follows:

Bottom-float leak.—Considerable milky fluid; distinct putrid odor; meat quite dark at surface and falls apart readily; fat completely broken down; interior of can shows well-marked evidences of corrosion.

Cap leak.—Large amount of thin, watery fluid; strong, putrid odor; meat is darker in color than normal and falls apart readily; the interstices between the meat filled with thin, watery fluid; fat completely broken down; interior of can corroded.

Vent leak.—Small amount of gray, turbid fluid; distinct putrid odor; meat darker than normal, soft and mushy, and falls apart readily; fat soft and pasty and has lost its original yellow color and become almost white; interior of can shows marked corrosion.

Sixth day: Temperature of test room at 7 a. m., 105°; at 12 m., 110°; at 4.30 p. m., 112°. One slow leaker found swelled and taken to laboratory for examination. This can showed a seam leak. The contents were as follows:

Seam leak.—Considerable watery fluid: pronounced putrid odor throughout; meat very dark, almost black at top of can; color of meat better toward bottom of can, but darker than normal; fat broken down; interior of can shows evidence of corrosion.

Seventh day: Temperature of test room at 7 a. m., 108°; at 12 m., 108°; at 5 p. m., 109°. Two slow leakers found swelled and taken to

laboratory for examination. Both cans showed float leaks. The cans were opened and contents noted, as follows:

Top-float leak.—Small amount of turbid, dirty-gray fluid; sour odor; meat dark throughout; fat soft and semifluid and of a dirty-gray color; several dark patches on the surface of the meat of a dark, metallic-looking material; interior of can shows marked corrosion.

Bottom-float leak.—Considerable milky fluid; sour odor; meat darker than normal; fat broken down into irregular, pale, flaky masses; interior of can corroded.

Eighth day: Temperature of test room at 7 a. m., 105°; at 9.30 a. m., 108°; at 4.30 p. m., 110°. No cans were taken out on this date, as none were found distinctly swelled.

Ninth day: Temperature of test room at 7 a. m., 110°; at 12 m., 112°; at 3 p. m., 114°. No cans were taken out on this date.

Tenth day: Temperature of test room at 7 a. m., 109°; 9 a. m., 109°; 5 p. m., 112°. Two slow leakers found swelled and taken to laboratory. Both cans showed float leaks. The contents were noted as follows:

Bottom-float leak No. 1.—Small amount of turbid fluid; pronounced sour odor; meat darker than normal and quite soft; fat soft and pasty; interior of can shows evidences of corrosion.

Bottom-float leak No. 2.—Small amount of dirty-gray fluid; pronounced sour odor; meat dark throughout, soft and mushy, and tends to fall apart easily; fat broken down into white flaky particles; considerable amount of thin fluid in the interstices of the meat; interior of can shows well-marked corrosion.

Eleventh day: Temperature of test room at 7 a. m., 110°; at 9.30 a. m., 110°. Three slow leakers found swelled and taken to laboratory. Two showed float leaks and one a vent leak. The cans were opened and contents noted, as follows:

Bottom-float leak No. 1.—Considerable turbid, dirty-gray fluid; marked sour odor; meat dark throughout and is soft and mushy and tends to fall apart readily; at the bottom of the can the meat is darker in color than at the top, and there is a slight but distinct putrid odor; considerable thin fluid in the interstices of the meat; fat broken down into white flaky masses; interior of can distinctly corroded.

Bottom-float leak No. 2.—Considerable milky fluid; sour odor; meat has fairly good red color, but is darker than normal, and tends to fall apart readily; fat soft and pasty; interior of can corroded.

Vent leak.—No fluid; distinctly putrid odor; meat very dark, almost black at sides and bottom of can; interior of can corroded.

The short-vacuum, overstuffed, collapsed, and sound cans which were placed in the test room along with the slow leakers just described were examined from day to day, but none showed any evidence of swelling. They were all removed from the test room on the eleventh day, or ten days from the beginning of the test, and taken to the laboratory and opened. The contents in every case were found

to be normal and most of the cans showed bright interiors; the interiors of some of the cans were tarnished, but not distinctly corroded.

TABLE 2.—*Results of Experiment II.*

Number of days in hot room.	Temperature of hot room.	Swelled cans.				
		Slow leakers.	Short-vacuum cans.	Overstuffed cans.	Collapsed cans.	Sound cans.
	° F.	*Number.*	*Number.*	*Number.*	*Number.*	*Number.*
0	105–109	0	0	0	0	0
1	107–110	0	0	0	0	0
2	112–114	0	0	0	0	0
3	108–112	0	0	0	0	0
4	110–112	3	0	0	0	0
5	105–112	1	0	0	0	0
6	108–109	2	0	0	0	0
7	105–110	0	0	0	0	0
8	110–114	0	0	0	0	0
9	109–112	2	0	0	0	0
10	110	3	0	0	0	0
Total		11	0	0	0	0

The results of this test agree in every particular with the results obtained in the test made at establishment X. All of the slow-leaking cans became swellers, well-marked putrefactive changes developed, and the interiors of the cans showed distinct evidences of corrosion. The short-vacuum, overstuffed, collapsed, and sound cans, on the other hand, showed no evidences of swelling; the contents of these cans were found to be perfectly normal, and the interiors of the cans were not corroded.

As in Experiment I, the swelled cans which developed in the course of this test could, in every instance, be traced to defective tins or faulty sealing and were not the result of faulty processing. In the run of corned beef from which the cans used in this experiment were taken comparatively few slow-leaking and swelled cans were detected by the Government inspectors, and the tins used in this instance were evidently of a better grade than those used in Experiment I.

BACTERIOLOGICAL EXAMINATION OF SLOW-LEAKING AND SOUND CANS.

Ten typical slow leakers and five sound 2-pound cans of corned beef from establishment X were selected for bacteriological examination. These cans were from the same lot as those used in Experiment I. All of the slow-leaking cans showed loose tin, but none were swelled. The cans were not incubated prior to examination, as it seemed desirable to determine whether bacteria are present in slow-leaking cans before they begin to swell. After a can has swelled its contents are generally conceded to be unfit for food.

TECHNIQUE EMPLOYED.

The top of the can was first sponged with bichlorid solution (1:1,000). Alcohol was then poured over the top and ignited. After the alcohol had burned off, the flame of a Bunsen burner was played over the top for a few moments as an additional precaution in order to insure complete sterilization of the surface. The can was then turned on one side and the top punctured by means of a sharp-pointed metal ice pick, previously sterilized by heating in a free flame. A small sterile pipette, graduated to 1 c. c., was then inserted in the opening and passed through to the bottom of the can. The pipette was gradually withdrawn, suction being made at the same time, and in this way a cubic centimeter of the juice was easily obtained. The mouthpiece of the pipette was plugged with sterile cotton in order to prevent possible contamination from the mouth of the operator. From the juice obtained in this way agar plates were made by adding 0.1 c. c. of juice to a tube of melted agar (45° C.) and immediately plating. Anaerobic shake cultures were also made at the same time by adding 0.1 c. c. of the juice to a tube of glucose agar, which had been previously boiled to expel any contained air and then cooled to 45° C. As this work was done in an improvised bacteriological laboratory which was not provided with an incubator, the cultures were grown at ordinary room temperature. After taking the cultures, each can was opened and its contents noted.

RESULTS OF EXAMINATION OF SLOW-LEAKING CANS.

The results of the examination of the ten slow-leaking cans were as follows:

Slow leaker No. 1.—Considerable thin, milky juice on opening can; distinct sour odor; meat noticeably darker than normal and tends to fall apart readily; fat soft and pasty; interior of can shows well-marked evidences of corrosion.

Agar plates at twenty-four hours (room temperature 33°–34° C.) show numerous small, brownish colonies. Anaerobic culture shows colonies similar to to those seen on agar plates.

Slow leaker No. 2.—Considerable thin, milky juice; sour odor; meat dark at surface, but has fairly good red color toward center; fat almost fluid and of a dirty-yellow color; interior of can shows evidence of corrosion.

Agar plates at twenty-four hours (room temperature 33° C.) show no apparent growth; at four days (room temperature 33°–36° C.) plates show no colonies of bacteria, but a number of mold colonies. Anaerobic cultures show no apparent growth.

Slow leaker No. 3.—Small amount of dirty-yellow juice; the surface of the meat is covered with a layer of dirty-yellow pasty material, which is probably broken down fat, and on the surface of this material there is a considerable quantity of dark, metallic-looking material, which seems to have come from the inner surface of the can; the fat is in a pasty condition and the meat has a distinct sour odor; interior of can corroded.

Agar plates at twenty-four hours (room temperature 33° C.) show numerous small brownish colonies. Anaerobic culture shows colonies similar to those seen on agar plates.

Slow leaker No. 4.—Small amount of dirty-yellow juice; meat dark throughout and tends to fall apart readily; sour odor; fat soft and pasty; interior of can shows evidences of corrosion.

Agar plates at twenty-four hours (room temperature 33° C.) show well-developed circular and oval colonies of a dark-brown color. Anaerobic culture shows similar colonies.

Slow leaker No. 5.—Considerable turbid, dirty-yellow fluid; meat darker than normal and falls apart readily; slight, but distinct putrid odor; fat soft and pasty; interior of can shows evidences of corrosion.

Agar plates at twenty-four hours (room temperature 33° C.) show no apparent growth, but at four days (room temperature 33°–36° C.) show several spreading brownish colonies. Anaerobic culture at four days shows a number of well-developed circular and oval colonies.

Slow leaker No. 6.—Considerable yellow turbid fluid; meat dark and falls apart readily; sour odor; fat soft and pasty; interior of can corroded.

Agar plates at twenty-four hours show no apparent growth; at four days (room temperature 33°–36° C.) show no colonies of bacteria, but one or two colonies of mold. Anaerobic culture at four days shows no growth.

Slow leaker No. 7.—Considerable turbid, milky fluid; meat darker than normal and tends to fall apart readily; sour odor; fat broken down; interior of can corroded.

Agar plates at twenty-four hours (room temperature 33° C.) show a few well-developed, brownish, spreading colonies with dark-brown oval centers, also a few pale-brown spreading colonies. Anaerobic cultures show a few circular and oval colonies, which appear white to the eye and dark brown under the low power of the microscope.

Slow leaker No. 8.—Considerable turbid, gray fluid; meat darker than normal; sour odor; interior of can shows evidences of corrosion.

Agar plates show no apparent growth after two days at room temperature (33°–36° C.). Anaerobic culture same as agar plates.

Slow leaker No. 9.—Considerable yellowish juice; meat very dark; well-marked sour odor; fat soft and pasty; interior of can corroded.

Agar plates at twenty-four hours (room temperature 33°–36° C.) show enormous numbers of small, irregular oval or circular brownish colonies. Anaerobic culture shows similar colonies.

Slow leaker No. 10.—Small amount of turbid yellow fluid; meat darker than normal; distinct sour odor; fat soft and pasty; interior of can corroded.

Agar plates at twenty-four hours show no apparent growth, but at three days (room temperature 33°–36° C.) show one or two spreading white colonies. Anaerobic culture at three days shows no apparent growth.

RESULTS OF EXAMINATION OF SOUND CANS.

The results of the examination of the five sound cans were as below:

Sound can No. 1.—No loose tin; sides are tight and well concaved, showing good vacuum; small amount of thin yellowish juice on opening can; meat shows a good bright color throughout and gives the normal odor of corned beef; fat firm and of a good yellow color; when can is inverted the contents hold together and retain shape of can; interior of can smooth, in places the tin has a tarnished appearance but shows no evidences of corrosion. Agar plates and anaerobic cultures negative.

Sound can No. 2.—Contents same as can No. 1. Agar plates and anaerobic cultures negative.

Sound can No. 3.—Contents same as can No. 1. Agar plates and anaerobic cultures negative.

Sound can No. 4.—Contents same as can No. 1. Agar plates and anaerobic cultures negative.

Sound can No. 5.—Contents same as can No. 1. Agar plates and anaerobic cultures negative.

SUMMARY OF BACTERIOLOGICAL FINDINGS.

Of the ten slow leakers which were examined bacteriologically seven showed bacteria, two showed molds, and one showed no growth. In other words, 70 per cent showed bacteria, 20 per cent showed molds, and 10 per cent showed no growth. In the case of the sound cans, on the other hand, agar plates and anaerobic cultures on glucose agar failed to reveal bacteria in a single instance.

The fact that three of the slow-leaking cans failed to show bacteria does not necessarily indicate that these cans were free from bacteria, for they may have contained only a few bacteria so located that they were not encountered in taking out portions for cultures. When bacteria gain entrance to a can it must require some time, of course, for them to multiply and become disseminated throughout the contents of the can, the length of time required depending upon the temperature and other conditions, and it is possible that in the cans in question this had not taken place.

The absence of bacteria from the sound cans would indicate that the bacteria in the slow-leaking cans gained entrance to these cans from the outside through leaks or defects in the tins and were not present in the cans immediately after processing. This is also borne out by the fact that all of the bacteria found in the slow-leaking cans, with one exception, were nonspore-bearing organisms which would, in all probability, have been killed by the temperature to which the cans were submitted in processing.

The bacteria which developed in the cultures made from the slow-leaking cans were isolated and grown on the different laboratory media. A number of different organisms were found, both micrococci and bacilli. Among the latter were *Bacillus subtilis*, *B. proteus vulgaris*, *B. coli communis* and a paracolon bacillus. Micrococci were found in all save one of the cans examined and when grown on the different laboratory media were found to correspond with *Staphylococcus pyogenes albus* and *citreus*.

No obligate anaerobes (organisms growing only in the absence of oxygen) were found in any of the cans; the organisms obtained from the anaerobic cultures were found upon examination to be the same as the aerobic growths, or, in other words, all of the organisms iso-

lated were optional anaerobes (i. e., organisms which grow almost as well without oxygen as with it).

All of the organisms found in the slow-leaking cans produced an acid reaction when grown in glucose bouillon and litmus milk, and the corrosion of the interiors of the cans was evidently due to the action of acids produced by the bacteria growing in the meat. The absence of corrosion in the sound cans indicates that under normal conditions the meat juices had no corrosive action on the tin.

While the bacterial forms found in the slow-leaking cans are not usually pathogenic, they may at times possess pathogenic properties, and some of them are capable of elaborating metabolic products of a toxic nature.

In view of the possible formation of toxic products in slow-leaking cans, the final inspection of all cans prior to shipment becomes an important point and one which should be carried out in order to safeguard the public. If this final inspection is not made, it would be possible for a slow-leaking can which had not begun to swell and in which only slight putrefactive changes had taken place to reach the consumer. The changes in such a can might be so slight as to escape the notice of the consumer, and yet the contents of the can, if eaten, might be capable of producing disastrous results, because of ptomaines or tox-albumins resulting from the growth of putrefactive organisms.

CONCLUSIONS.

1. The majority of slow-leaking cans contain bacteria, which invariably set up putrefactive or fermentative changes in the contents of the cans.

2. The majority of slow-leaking cans, when incubated for ten days at a temperature of 100° to 110° F., will develop into "swellers."

3. Short-vacuum, overstuffed, and collapsed cans will not swell upon incubation provided there are no breaks in the tins.

4. The swelling of slow-leaking cans upon incubation is due to the formation of gases resulting from the growth of bacteria within the cans.

5. The product contained in slow-leaking cans is not a safe article for food even though it be reprocessed.

THE DEHORNING OF CATTLE.

By RICHARD W. HICKMAN, V. M. D.,
Chief of the Quarantine Division.

The frequent inquiries received by this Bureau for information concerning the dehorning of cattle and the means used for their control during the dehorning operation, also concerning the proper method of treating calves to prevent their horns from growing, have prompted the writing of this article. The writer will endeavor to present the subject in the most practical manner for the guidance of the dairy farmer or other cattle owner who may be in quest of this information; first describing the operation as universally practiced in the East prior to the introduction of the dehorning instrument or dehorning knife and as practiced on his own herd in Orange County, N. Y., in the late nineties, where the old-fashioned board stanchions were and still are in use to a considerable extent. Dehorning by means of an instrument, also the prevention of growth of horns on young calves, will be described later.

DEHORNING BY SNUBBING HEAD TO STANCHION RAIL.

The dehorning of partly developed and adult cattle can be very satisfactorily performed without other apparatus or instruments than a good strong clothesline and a clean, sharp meat saw—or a miter saw with a rigid back—in the hands of a fairly good mechanic. The same simple means for controlling the animal is just as applicable when the dehorning knife is to be used as when the horns are to be removed with the saw. This consists in securing the head of the animal to the horizontal rail or stringpiece which holds the upper ends of the stanchion boards. The animal is put in the stanchion in the usual manner; then one end of a heavy clothesline is passed around the upper part of the neck and tied in a knot that will not slip, otherwise it will choke the animal. The free end of the rope is now carried between the horns, through the stanchion to the front, up and over the horizontal stanchion rail, then down underneath the neck and up and over the top of the stanchion rail to an assistant, who should hold it firmly. Now release the stanchion, allowing the animal to withdraw its head, so that the horns are just inside of the stanchion rail or stringpiece; then, keeping the rope tight, pass it once around

the muzzle, up and over the stanchion rail, and through to the front again to the hands of the assistant, who should stand 3 or 4 feet in front of the animal and hold the rope firmly, but prepared to release it when told to do so by the operator. The animal is now ready for the dehorning operation.

It is necessary that the rope be held by an assistant, as in the event of the animal struggling during the operation so as to throw itself off its feet, or if there appears to be danger of its choking, the rope may be slackened promptly at the word of the operator and the animal partly released. This, however, is rarely necessary, for as soon as the head is secured the operator should be ready, standing at the right shoulder of the animal with his saw, and proceed to saw off first the right and then the left horn. The horns should be severed

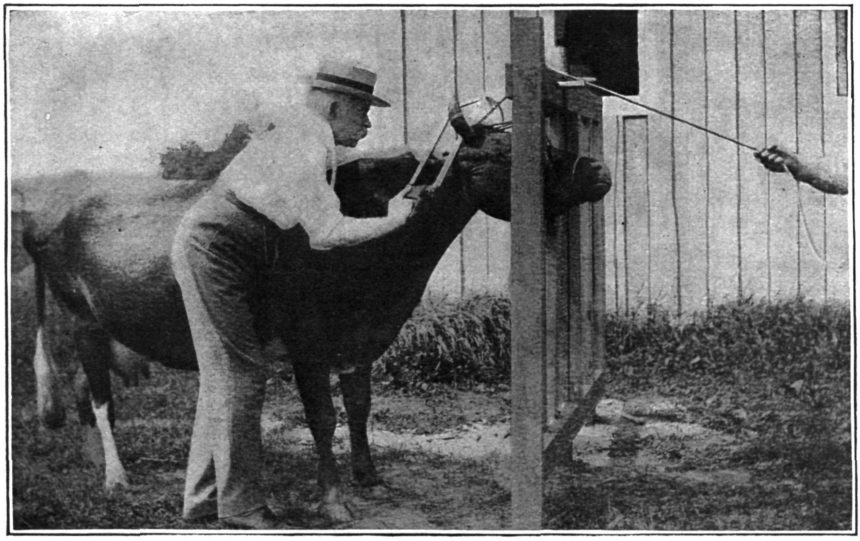

FIG. 47.—Dehorning with saw, cow's head snubbed to stanchion rail.

at a point from a quarter to a half inch below where the skin joins the base of the horn, cutting from the back toward the front. Figure 47 shows the animal and the operator in position for the dehorning operation by this method. It is a good plan before commencing the real work to experiment upon an animal in the matter of control by snubbing the head to the stanchion rail as described.

If the stanchion rail is too wide to permit of properly securing the lower part as well as the upper part of the animal's head, the turn of the rope around the muzzle may be omitted and the last lap of the rope carried around the stanchion rail to the front and to the hands of the assistant. The rope should pass each time over the neck of the animal to the stanchion rail so that the laps are between the horns, in order that the rope may not interfere with the work of the saw.

There are men in what are known as the milk districts adjacent to large cities, where large numbers of dairy cows abound, who go about from farm to farm dehorning animals in this manner, charging for their services in some instances as little as 5 cents per horn or 10 cents per animal.

NEW ZEALAND REPORT FAVORABLE TO USE OF SAW.

There was published in the report of the New Zealand department of agriculture for 1904 a description of the operation of dehorning cattle by the Government veterinarian at New Plymouth, in which it was shown that a cage had been used for the restraint of the animals during the operation, closely resembling a box such as used for hoisting horses out of ships, the box being hauled on a wagon from farm to farm as needed. In discussing the various means for the removal of the horns the report was very favorable to the use of the saw in dehorning full-grown cattle. It was stated that in the dehorning of over 10,000 cows with the saw there were no deaths due to the operation, while in cows dehorned by shears, or the guillotine, as it is sometimes called, there was trouble afterwards in healing of the wounds, due, no doubt, to the crushing, fracturing action which this instrument has upon old horns, where ossification of the cores is advanced. Because of this condition it was recommended that for mature animals a bone saw be used.

TREATMENT AFTER DEHORNING.

It is not usual to apply any preparation after the operation of dehorning to prevent bleeding, as the loss of blood is not sufficient, as a rule, to be of consequence. Care should be taken, however, to prevent substances from getting into the openings left after the horns are removed. The horn cores are elongations of the frontal bones of the skull, and are hollow. They communicate with the frontal sinuses, or air spaces, of the head; therefore foreign substances which would act as an irritant in these cavities are apt to set up an inflammation, resulting in the formation of pus or an abscess, which may prove quite serious. Fragments of horn detached in the process of dehorning would serve as such irritant and by their presence in these cavities cause inflammation. This trouble, though, is of infrequent occurrence, but would appear more liable to happen when the dehorning instruments are used, on account of their tendency to crush, especially in the case of old animals, whereas the saw cuts clean. If proper care is taken, however, such an occurrence following dehorning may in almost every instance be avoided.

Occasionally animals after being dehorned and turned out of the stable will rub their heads against a dirt or gravel bank or the rough bark of a tree, and foreign material may thus get into the cavities,

though usually the soreness of the parts is sufficient to prevent this.

If the animals are dehorned when flies are about, it is well to apply some pine tar with a view to keeping flies from the wounds. Some operators do this in nearly all cases, thinking that it facilitates healing. The dehorning operation should always, when possible, be performed in cool weather, and upon animals which have at least attained the age of two years.

IS DEHORNING CRUEL?

Inquiries are frequently received as to whether the operation of dehorning is very painful, and whether it may not be classed as cruelty to animals. Those who have had an extensive experience in dehorning appear to agree that the pain induced by the operation has been greatly overestimated, as careful observation has shown that shrinkage in the milk yield following the dehorning of cows, as well as the decrease in the butterfat yield, are very temporary and insignificant. On the other hand, the worry, pain, and cruelty often inflicted by cattle upon their mates before being deprived of their horns is much more to be considered, and not infrequently results in the death of a valuable animal. A neighbor on an adjoining farm to that owned by the writer a few years ago lost two good milch cows in one winter through their being disemboweled by the horns of barnyard mates while out for exercise. He dehorned his entire herd almost immediately afterwards, an example which was followed by the writer in regard to those members of his herd that had not previously been dehorned.

As an encouragement to owners of especially pretty dairy cows whose horns are thought to be really ornamental, it should be said that the quiet contentment of the underlings of the herd and the seeming realization of the "bosses" that the others were no longer afraid of them, since all were now on an equal footing and without the means of inflicting serious injury upon one another, was both amusing and a matter of great satisfaction; and notwithstanding the horns had been reluctantly removed from a number of individuals upon which they were considered an ornament, I felt amply repaid for the sacrifice. As a result of this experience and the testimony of many other owners, I am convinced that the security which is felt in the increased safety of the animals much more than compensates for the loss of beauty resulting from the removal of these harmful and, in domestication, useless weapons of bovine animals.

DEHORNING ON THE RANGE.

While the cattle ranchman of the West seems to be equal to every requirement and emergency of his vocation, and is probably informed

with regard to the dehorning of his stock, this article would be incomplete without a description of the dehorning operation as practiced in that part of the country. For information regarding this phase of the subject the writer is indebted to Drs. R. H. Treacy and E. T. Davison, of this Bureau.

In the range country of the West dehorning has been extensively practiced for a number of years, and all of the various methods have been used in restraining the animals, as well as in the removal of their horns. In some instances the methods practiced are extremely crude, consisting in simply roping and throwing the animal and cutting off the horns with an ax. Most frequently, however, no matter what

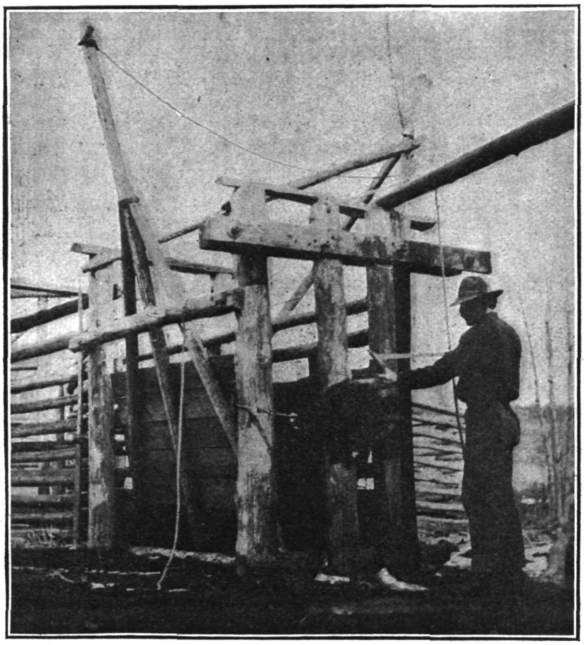

FIG. 48.—Dehorning with saw; animal held in squeezer connected with corral.

may be the means of control, either the saw or the dehorning shears are used, as shown in the accompanying illustrations. As a general thing the corral and chute which form a part of the equipment of every well-appointed cattle ranch are used for this purpose. Dehorning with an ax should never be attempted, as, no matter how keen the edge of the ax or how true the aim of the axman, he is working on a living animal, and only a slight movement of the head would result in a deviation of the stroke, and would thus be liable to cause, if nothing more serious, the infliction of unnecessary pain and suffering to the animal.

It is the usual custom in the West to gather the cattle to be dehorned in a corral, either during the early spring, before the fly

season begins, or in the fall, after the fly season has passed. At one side of this corral is a gate opening into another smaller inclosure, which is known as the chute pen. The sides of this converge to form an entrance into a narrow chute, which is usually made long enough for about three cattle, though but one is permitted to enter the working end of the chute at a time, the others being kept back by crossbars. At the front end of this chute is what is known as a squeezer, the formation of which is best understood by a reference to the illustration (fig. 48). After the animal enters the squeezer the squeeze gate is pressed close against the side of the animal to prevent lateral movement, the stanchion is closed on the neck, and the head turned and secured to the post by means of a nose clamp and lead, first at

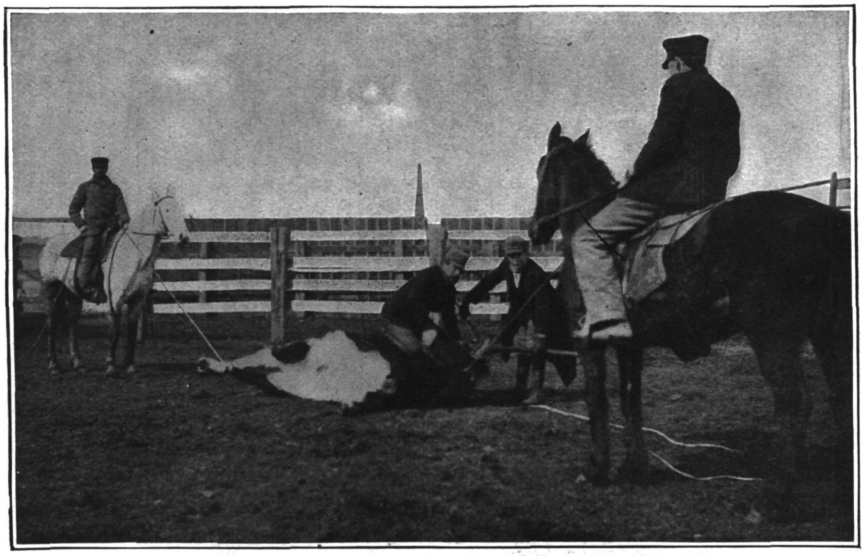

FIG. 49.—Dehorning animal thrown and held with ropes by men on horseback. Horns removed by means of dehorning shears.

one side of the chute and then the other, as required for the removal of the horns. (See fig. 48.)

In the construction of these chutes it is usual to have on the side opposite the squeeze gate a movable plank which can be taken out to expose the side of the animal for branding. In the entire construction of such a corral and chute it is best not to economize in lumber or bolts, as it should be strong and durable. By this method the animal is controlled in a manner that is without danger to itself or to the operator, and satisfactory dehorning can be accomplished.

Another method of restraint is to throw the animal and hold it stretched flat on the ground by means of a rope around its neck held by a man on horseback with a turn around the saddle pommel, a second rope is around the hind feet, similarly held by another man

on horseback. In the absence of horses these ropes can be secured by taking a turn around a post. After the animal is thus secured an assistant grasps the nose and upper horn, turning the head so that the lower horn can be removed first. This obviates the danger of fracturing the lower horn, and allows the blood to flow directly on the ground and the head to be held flat for the removal of the upper horn. (See fig. 49.) As shown in the illustration, the dehorning shears are frequently used, but there seems to be a tendency in some localities toward giving preference to the saw. Whether a saw or the shears be used, the cut must be made uniformly at a line sufficiently below where the skin joins the horn, in order to get satisfactory results from the operation. If the cut is made too high an irregular,

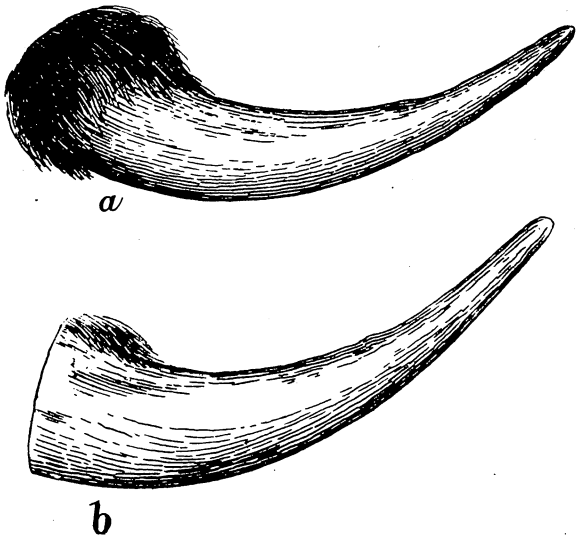

FIG. 50.—Horns showing (*a*) proper and (*b*) improper cutting.

gnarly growth of horn is very apt to follow. It will be seen that the point of union of the skin and horn varies in different cattle; hence there can be no rule of measurement, except as the eye becomes trained to see the point or line at which the cut should be made, which can soon be easily and accurately approximated by carefully noticing the variation referred to in different animals, which variation is largely influenced by breed, together with the texture, quality, and setting of the horns. In the beef breeds fully one-half inch of skin, all around, is usually taken off with the horn.

Figure 50 illustrates the difference between a proper and an improper cutting, and figures 51 and 52 show the appearance of animals' heads after proper and improper dehorning.

Many ranchmen apply preparations of pine tar and alcohol, or pine tar and turpentine, after dehorning, to lessen the bleeding and keep the flies away.

INSTRUMENTS FOR DEHORNING.

In recent years, since two or three good dehorning instruments have come into use, this means of dehorning is considered by some cattle owners to be preferable, especially where large numbers of cattle are to be dehorned. There are a number of different types of commercial dehorning instruments, acting somewhat in the manner of a guillotine. Some varieties have a stationary knife blade, with its cutting edge shaped like a very wide V, and opposing this knife another knife of similar shape, moving in a slide, so that the cutting edges cut the horn, which has previously been inserted in the opening between the knives, from all four sides at once, all the edges passing the center at the same time. Other varieties have a movable knife with one oblique or one curved edge, exerting its cutting effect in one direction only. The power for cutting with these instruments is supplied by pulling together two long handles, which, in order to transmit a greater force, are generally constructed so that they act through the medium of a series of cogs.

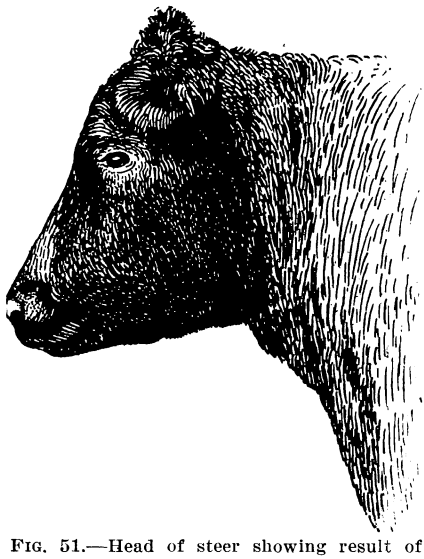

FIG. 51.—Head of steer showing result of proper dehorning.

In dehorning with these instruments the horn should be inserted through the opening and the knives closed so that their edges set firmly against the horn in such a position that the cut will be made in the same direction as indicated when the saw is used. The blades should be kept covered with a thick oil or grease. The handles should be drawn together with a quick, firm, strong pull, so that the horn will be completely severed by the first

FIG. 52.—Head of steer showing bad appearance caused by improper dehorning.

act and without twisting. The second pull or twisting is more liable to splinter the horn, especially as the animal would then be struggling. Care should be taken that the blades are kept sharpened on their original bevel. Any of the previously described methods of restraint may be employed.

Dehorning knives or dehorning instruments can be procured of the manufacturers and of dealers in veterinary instruments.

TO PREVENT HORNS GROWING ON YOUNG CALVES.

When circumstances are favorable, as in the case of farmers who build up their herds by raising the progeny, the horns may be prevented from growing by a simple and practically painless method, and the custom of preventing the growth of the horns rather than deferring the matter with the necessity of removing them from the grown animal is becoming more popular and more generally practiced under all conditions except in the case of calves dropped on the open range. To do this successfully it is necessary that the calf should be treated not later than one week after its birth, preferably when it is from three to five days old. The agent to be used may be either caustic soda or caustic potash, both of which may be procured in the drug stores in the form of sticks about the thickness of an ordinary lead pencil and 5 inches long. These caustics must be handled with care, as they dissolve the cuticle and may make the hands or fingers sore. The preparation of the calf consists in first clipping the hair from the parts, washing clean with soap and warm water, and thoroughly drying with a cloth or towel. The stick of caustic should be wrapped in a piece of paper to protect the hands and fingers, leaving one end of the stick uncovered.

APPLYING THE CAUSTIC.

Moisten the uncovered end slightly and rub it on the horn buttons or little points which may be felt on the calf's head, first on one and then the other, alternately, two or three times on each, allowing the caustic to dry after each application. Be very careful to apply the caustic to the horn button only. If it is brought in contact with the surrounding skin it will cause pain. Be very careful also not to have too much moisture on the stick of caustic, as it will excoriate the skin and make the parts sore if allowed to run down over the face. After treatment keep the animal protected from rain, as water on the head after the application of caustic will cause it to run down over the face. This must be carefully avoided.

CAUSTIC MIXTURES.

All of the preparations which have been used to prevent horns from growing on young animals have been composed largely of one

or the other of the caustics above mentioned. In view of the fact that these substances alone, without the admixture of others, answer the purpose satisfactorily, it would hardly seem to be necessary to give the following formula, but as it was used with good results when much was being written in regard to dehorning compounds, it has been thought best to insert it here, chiefly to prevent the necessity for any further inquiry on the part of those who may have used it and are no longer in possession of it. The formula was published in the Eighth and Ninth Annual Reports of the Bureau of Animal Industry for 1891 and 1892, and the preparation was at that time quite largely used. It was made by combining in an emulsion 50 per cent of caustic soda, 25 per cent of kerosene, and 25 per cent of water. The caustic soda is dissolved in the water and heated to the boiling point, then removed from the fire, and the kerosene added gradually, while vigorously stirring the mixture. This emulsion is applied in very much the same manner as the stick caustic, except that it is necessary to employ a short, stiff brush, or meat skewer, using the large end, which has been previously mashed or contused to form a stubby brush. Two or three applications should be made to each horn button, as in the case of the stick caustic, with intervals to allow it to dry.

AGE WHEN CAUSTICS ARE NOT EFFECTIVE.

When a calf is three or four weeks old the caustics or caustic preparations are of little or no use. The horns on young animals of this age can be removed by one cut of a good sharp pocket knife, but when the treatment is delayed to this age there is considerable hemorrhage as a result of cutting the starting horns, which can be entirely avoided if the animals are treated with one of the caustics at the earlier age above indicated.

DEVELOPMENT OF THE HORNS.

In the very young calf the horn button, or point that will ultimately develop into a horn, has scarcely any attachment to the skull, and may be felt as a small button embedded in the skin. In this early stage it may be easily removed with a sharp knife or a pair of curved scissors, but even then caustics should be applied to kill any remaining cell life belonging to this germ point; otherwise there may be some subsequent irregular horn growth, which is more or less of a disfigurement. This is likewise apt to be the result if the treatment of the calf is delayed until the animal is one to a few months old, whereas in the young calf at the age previously indicated there is little or no tendency to this horn growth if due care has been exercised in the application of the caustic.

THE DAIRY INDUSTRY IN THE SOUTH.

INTRODUCTION.

By B. H. RAWL,
Assistant Dairyman, Dairy Division.

In 1906 the Dairy Division began systematic field work in the Southern States for the development of the dairy industry in that section. This work has been carried on in cooperation with State experiment stations, agricultural colleges, and departments of agriculture, and has steadily increased until at present a representative of the Dairy Division is working in each of nine Southern States. The work has consisted largely of personal effort among the dairy farmers, with a view to teaching them better methods, and has produced good results. Many farmers have become enthusiastic over the possibilities of the dairy business because of the increased profit from their dairies, and are beginning to appreciate the real significance of dairying as it relates to southern agriculture.

Fundamental to any question of production is the question of markets, and in order that the field workers might properly advise dairymen regarding the marketing of their products it was found necessary to make a systematic study of this subject. Consequently during the fall of 1906 and the winter of 1906–7 a representative of this division made a close inspection of the markets of 50 cities, the results of which are shown in the article next following, under the title of "Southern Markets for Dairy Products." An effort was made in each case to determine the demands of the consumers and the quality, source, and price of all dairy products, particularly butter, renovated butter, cheese, and condensed milk, also oleomargarin. It may be seen from the article referred to that there is a decided lack of uniformity in the quality and price of butter and cream in southern cities. Prices were generally lower when this inspection was made than they were in 1907–8, but other conditions have not materially changed.

In the prosecution of this work, and in view of previous investigations reported by C. F. Doane in Bulletin 70 of the Bureau of Animal Industry, it was realized that a decided improvement in the quality of the milk supply of the cities throughout the South was needed. Insanitary methods of producing and handling milk were

a great menace to public health. The Dairy Division in 1907 assigned Inspector George M. Whitaker to investigate the situation more fully and give assistance in applying methods that would bring about improvement. That work is still in progress, but it has already been the means of several cities adopting modern systems of inspection which will assist the farmers in overcoming difficulties that arise in producing a safe quality of milk. The second article here following, by Mr. Whitaker, discusses various phases of this question.

The report on markets shows that only a small part of the dairy products consumed in the South are produced in that section. A preliminary survey of the whole field was made in 1905 by the writer, the report of which resulted in a special appropriation by Congress that year to prosecute this work on a more extended scale. This support by Congress has since been continued in the general appropriation for the Bureau of Animal Industry. The third article describes the conditions which seem to be responsible for this small production of dairy products in the Southern States, and tells why dairying has remained an undeveloped industry in that section of the country.

SOUTHERN MARKETS FOR DAIRY PRODUCTS.

By DUNCAN STUART,

Assistant in Dairying, Dairy Division.

During several months in 1906–7, 50 of the larger cities in 13 States of the South were visited by the writer in order to obtain data relative to the dairy markets of that part of the country. Statistics were collected as to the amounts of butter, cheese, milk, condensed milk, and cream handled in these cities, and an attempt was made to determine what proportion of these amounts was brought in from the Northern and Western States. Table 6 shows how small a part of the butter and cheese consumed in this territory is produced by southern dairymen. In looking over these figures it must be borne in mind also that the prices obtained at that time (1906–7) were lower than at the present time (1908), hence the amounts that could be saved by home production of these articles would be even greater now.

During the past year, however, many new creameries have been established, particularly in Kentucky and Texas. The census of 1900 reported 7 creameries in Kentucky; the census of 1905 reported only 3; while in the spring of 1908 reports show that there are 42. These facts indicate that the dairy industry is advancing and is becoming of more importance in the States under consideration.

BUTTER.

CREAMERY BUTTER OF THE SOUTH.

The creamery butter production of the South is entirely inadequate to meet the demand, there being only a few regular creameries in the Southern States. It will be seen from Tables 1 and 4 that the quantity made is less than one-twentieth of that brought in. One creamery, at Fort Worth, Tex., uses cream from long distances in that State, and in addition gets a part of its supply from points in Oklahoma. Chattanooga, Tenn., also has creameries of this kind. The southern creameries are making a grade of butter which sells for a price equal to that of the best northern and western product. Large amounts of print butter are shipped in by the butter companies of Illinois, Wisconsin, and Kansas; tub butter also is used extensively, the larger retail stores using the "cut-to-weight" butter cutters. Some butter is made in cities by the large milk plants, which turn their surplus milk and cream into butter. This fresh butter is put up in attractive prints and finds a ready sale among the milk customers.

Butter is shipped in refrigerator cars to the larger trade centers and from these points is reshipped to the smaller towns. This latter shipment is usually without refrigeration. This is the great disadvantage of the butter business of the South—the lack of proper equipment for handling the commodity. The small retail stores often do not have proper cooling facilities, consequently the butter is soft and in many cases has become rancid before it is sold to the consumer.

It will be noted in Table 4 that about 23,435,000 pounds of creamery butter is brought in from Northern and Western States.

The census of 1900 reported the production of creamery and dairy butter in the South as follows:

TABLE 1.—*Production of creamery and farm butter in Southern States, census of 1900.*

State.	Butter made on farms.	Butter made in creameries.
	Pounds.	*Pounds.*
Alabama	19,121,964	17,357
Arkansas	21,585,258	168,575
Florida	1,386,445	.....
Georgia	15,111,494	48,960
Kentucky	30,446,381	184,663
Louisiana	4,918,229	.....
Mississippi	18,881,236	48,525
North Carolina	16,913,802	.....
South Carolina	8,150,437	.....
Tennessee	29,091,696	207,823
Texas	47,991,492	252,714
Virginia	19,905,830	170,521
West Virginia	16,913,129	41,000
Total	250,417,393	1,140,138

From the above figures it will be noted that of the total amount of butter produced in the South in 1899, only a very small part was made in creameries. It may be stated also that the relative proportion has not materially changed since.

DAIRY AND COUNTRY BUTTER.

The quality of the dairy butter varies very much. Some of the better dairies are making a product almost, if not quite, equal to the best creamery butter. It is delivered to the consumers in pound prints neatly wrapped in parchment paper and bearing the monogram or name of the dairy. Though this grade of butter is comparatively limited in quantity, it is now being supplied to the following cities by the near-by dairymen: Shreveport, La.; Raleigh, N. C.; Columbia, S. C.; Macon, Augusta, and Atlanta, Ga.; Tallahassee, Fla.; Montgomery and Birmingham, Ala.; Dallas, Austin, and San Antonio, Tex.

A large amount of dairy butter is shipped to the Carolinas and to Georgia from Tennessee in 5-pound and 10-pound tin pails. Some dairy butter made in Georgia has been shipped to market in South Carolina and sold there as Tennessee butter.

Of quite a different grade is the butter that is handled by the country merchant. This butter is brought to him in various shapes—in boxes, round prints, rolls, etc.—and in various shades of color. He retails what he can of it, and the balance he ships in tin cans or in barrels to the commission men in the large cities. By the time it reaches them it is apt to be very rancid, as a result of not having been properly washed when it was churned. One needs only to visit these commission merchants to see a product resembling axle grease more than butter. This quality of butter is bought as low as 7 cents a pound. The butter dealers of Austin, San Antonio, and Fort Worth together ship annually about 300,000 pounds of this grade of butter to the renovating factories.

The butter produced in the South, even if it were all of the best quality, is of insufficient quantity to meet the demand; yet a large part of that which is produced has to be shipped to the renovating factories, as noted above, and treated by them before it is actually consumed. We see, therefore, that an advance must be made in the methods of manufacture, as well as in the amount turned out, before southern butter can meet the demands of consumers in that section.

RENOVATED BUTTER.

Quite a large amount of the butter consumed in the South is renovated or "process" butter. Reports gathered from 50 cities show an annual consumption of about 7,163,000 pounds, while the

production of the renovating factories in that section of the country is only about 33,300 pounds.

Renovated butter is retailed at an average price of 26 cents a pound, much of it selling for 30 cents, and during the past winter (1907–8) it has sold as high as 35 cents a pound. Using the average price of 26 cents a pound, the annual value of the sales of this grade of butter amounts to about $1,862,300 for 39 cities. Inasmuch as renovated butter can be bought at a lower price than creamery butter there is a great temptation to sell it as creamery butter, and some dealers are undoubtedly doing this.

OLEOMARGARIN.

The Fifty-sixth Congress, second session, in Senate Report 2043, under date of January 26, 1901, published data furnished by the Treasury Department from its figures for the year 1899 showing the amount of oleomargarin shipped into the various States. At that time 11.5 per cent of the total amount consumed was used in the South.

Since the act of May 9, 1902, which imposed a tax of 10 cents a pound on the colored product and one-fourth of a cent on the uncolored, the consumption of oleomargarin has decreased. However, the consumption of this article is still great in some of the larger cities, especially in the winter season. Large amounts are handled in Norfolk, Richmond, Charlottesville, and Lynchburg, Va.; Chattanooga, Nashville, and Memphis, Tenn., and Louisville, Lexington, Newport, and Covington, Ky. One of these cities uses as much as 700,000 pounds annually.

The colored product retails as high as 32 cents a pound, while the uncolored retails at an average of from 15 to 20 cents. Of the amount consumed in the South less than 8 per cent is manufactured in that section.

The scarcity of creamery butter in the winter season, and the unevenness of color and the tendency to rancidity which characterizes the country butter, account for the large consumption of the better grades of oleomargarin.

The following table shows the amounts of oleomargarin used by States in 1899 (according to the census of 1900) and the approximate amounts used in the fiscal year 1905–6.

TABLE 2.—*Quantity of oleomargarin shipped into Southern States in 1899 and in fiscal year 1905–6.*

State.	1899.	Fiscal year 1905–6.
	Pounds.	*Pounds.*
Alabama	226,053	347,488
Arkansas	380,389	257,141
Florida	590,225	145,827
Georgia	495,004	172,494
Kentucky	1,490,577	1,286,402
Louisiana	1,043,502	345,847
Mississippi	104,622	61,289
North Carolina	110,244	125,605
South Carolina	258,159	72,843
Tennessee	714,640	475,867
Texas	1,518,264	570,088
Virginia	1,159,400	1,326,152
West Virginia	1,206,865	1,579,180
Total	9,297,944	6,766,223

CHEESE.

Practically no whole-milk cheese, or cheese of the Cheddar type, is manufactured in the South. A few small factories are reported in South Carolina (two at Easley), Virginia, and West Virginia, but the output of these factories is very insignificant in comparison with the large amount consumed. In the 50 cities visited in 13 States the cheese handled amounted to approximately 42,000,000 pounds annually, while the production in the States mentioned, as indicated by the census figures, was probably less than 2 per cent of this total. The per capita consumption of cheese in the South is quite considerable, as large quantities are used by the laboring classes, who depend largely on crackers and cheese for their midday lunch.

Large amounts of imported and American-made cheese of foreign types are consumed in many of the cities. Large quantities of Roquefort, Camembert, Swiss, Brick, Gorgonzola, Parmesan, Limburg, and Roman cheese are used. Roman cheese is especially popular in New Orleans, while cheese imported from Sicily is used to a large extent in Tampa, Fla. The so-called cream cheese, made by putting clabbered milk into molds to drain, is used in great quantities as a breakfast dish in New Orleans. Texas cities handle large amounts of Brick cheese, but they also consume much of the imported varieties, especially during the cool weather.

The "Daisy" type of Cheddar cheese is popular. Being a small cheese—20 to 23 pounds—it is easily handled during the hot season, and in addition is readily cut by the automatic cheese-cutting machines. "Flats" and "twins" are used to some extent in cool weather in the extreme Southern States, and to a larger degree in the Carolinas, Kentucky, and Tennessee.

Whole-milk cheese usually retails at 20 to 25 cents a pound, but in a few cities it is retailed as low as 17 cents a pound. Skim-milk cheese is being sold to some extent and is not always correctly branded. New York State cheese and Wisconsin cheese are the principal ones on the Southern market.

CHEESE PRODUCTION OF THE SOUTH.

The census of 1900 gives the following figures on the cheese production of the Southern States:

TABLE 3.—*Quantity of cheese produced in Southern States, census of 1900.*

State.	Cheese made on farms.	Cheese made in factories.
	Pounds.	*Pounds.*
Alabama	36,374	10,000
Arkansas	18,385	12,600
Florida	3,751	.....
Georgia	2,236	.....
Kentucky	45,759	28,000
Louisiana	135,104	.....
Mississippi	28,272	.....
North Carolina	28,883	.....
South Carolina	1,081	.....
Tennessee	26,622	6,201
Texas	136,133	58,290
Virginia	31,697	57,000
West Virginia	74,243	40,860
Total	568,540	212,951

From the above figures it will be seen that the cheese production of the South is wholly inadequate to the supply needed for consumption. The estimated amounts consumed in the larger cities of the above States, as shown in Table 4, totaled 41,582,545 pounds.

ICE CREAM.

There is a heavy ice cream consumption in southern cities. Much of the product, however, is of low grade, being made from whole milk and from bulk condensed milk. The price varies from 70 cents to $3 a gallon, the latter price being paid for a fancy grade of cream put up in special forms. The average retail price is about $1.50 a gallon.

The following are some of the cities manufacturing large amounts of ice cream: Memphis, Chattanooga, and Nashville, Tenn; Little Rock, Ark.; Fort Worth, San Antonio, and Dallas, Tex.; Louisville, Ky.; Jackson, Miss.; Birmingham, Ala., and Macon and Atlanta, Ga. Memphis ships the largest amount, one of its manufacturers making as high as 3,000 gallons in one day in the summer season. Ice cream manufactured in Tennessee and Georgia is shipped to points as far south as Florida.

CREAM.

In the South the consumption of cream is small. This is due to the scarcity of fresh cream rather than to a lack of demand for this dairy product. The cream sold is also very variable in quality, some of it being only equal to a rich milk. Much unsweetened condensed milk is used in the place of cream. The fresh cream in some cities is supplied by near-by dairymen, while others get it from long distances. The larger cities of Georgia, with the exception of Savannah, are fairly well supplied with cream. Newport and Covington, Ky., get a part of their supply from Cincinnati dealers, while Louisville gets cream by rail from Illinois and Indiana. The North Carolina cities depend largely on local product; however, a small amount is shipped in from Virginia. Tennessee cities, with the exception of Memphis, are well supplied with local product. Texas cities, excepting Fort Worth, are also supplied from within the State.

Mobile, Ala., gets a part of its supply from Tennessee; all the larger cities of Florida, with the exception of Tallahassee, get a large part of their cream from points in Georgia and Tennessee; a portion of New Orleans's supply comes from Tennessee and Illinois; Jackson, Miss., gets a small supply from Tennessee; Memphis gets a part of its supply from Mississippi and Arkansas, and Norfolk, Portsmouth, and Richmond, Va., receive fresh cream from New York City; Wilmington, N. C., Jacksonville and St. Augustine, Fla., and Galveston, Tex., depend largely on unsweetened condensed milk.

CONDENSED MILK.

Condensed milk is consumed in large quantities in southern cities and to some extent on the farms. It is put up in small cans selling for 5 and 10 cents each, but is also sold in larger sizes. The smaller sizes are very convenient for family use during the hot season. In many sections the supply of fresh milk is unfit for infant feeding and the physician invariably recommends condensed milk.

Fresh cream being scarce, condensed milk is used as a substitute. This is used as cream and is also manufactured into ice cream. Unsweetened condensed milk is received in 10-gallon cans at Jacksonville from New York City. Memphis gets bulk condensed milk from Arkansas. St. Augustine and Galveston also use large amounts of the unsweetened product.

QUANTITIES AND PRICES OF DAIRY PRODUCTS.

The following tables give data regarding the dairy markets of the 50 cities, in 13 States of the South, discussed in the preceding pages:

TABLE 4.—*Quantity of dairy products handled in 50 southern cities, fiscal year 1905–6.*

City.	Approximate quantity handled of—					Milk sold daily.	
	Creamery butter.	Renovated butter.	Oleomargarin.[a]	Cheese.	Condensed milk.	Quantity.	Amount bottled.
Arkansas:	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Gallons.*	*Per cent.*
Fort Smith	126,000	15,000	26,100	572,000	291,360	200	.....
Little Rock	500,000	100,000	51,000	800,000	499,200	3,300	10
Alabama:							
Birmingham	291,205	278,000	136,000	1,767,520	1,453,680	1,735	33
Mobile	882,400	118,000	49,300	916,000	1,227,600	1,100	.....
Montgomery	153,708	124,540	76,000	1,203,000	425,040	600	.....
Florida:							
Jacksonville	1,500,000	200,000	150,000	1,675,650	2,803,200	1,250	50
Pensacola	449,340	28,541	17,800	297,120	610,800	450	.....
St. Augustine	.....	(b)	2,000	.....	.....	400	.....
Tallahassee	9,000	.....	.....	41,760	27,360	150	.....
Tampa	742,070	91,600	18,550	400,830	2,683,680	1,500	75
Georgia:							
Atlanta	630,000	20,000	61,000	2,117,500	1,126,320	5,000	.....
Augusta	380,100	(?)	8,440	1,289,500	.....	1,200	.....
Macon	97,740	98,000	12,900	1,395,950	362,592	800	.....
Savannah	96,900	229,263	52,730	946,307	1,536,000	.....	.....
Valdosta	102,750	34,000	600	185,000	122,208	200	.....
Kentucky:							
Covington	190,000	60,000	92,900	250,000	.....	2,500	33
Lexington	50,000	.....	162,440	270,000	48,000	2,500	50
Louisville	2,000,000	500,000	699,000	2,000,000	888,000	10,000	60
Newport	150,000	50,000	69,000	150,000	.....	1,750	.....
Louisiana:							
Baton Rouge	43,500	26,300	19,200	98,000	416,640	.....	.....
New Orleans	4,700,000	800,000	187,463	2,069,976	12,480,000	16,000	.....
Shreveport	60,700	28,000	37,840	612,000	708,000	1,100	.....
Mississippi:							
Jackson	58,000	24,000	6,900	192,000	157,440	510	.....
Meridian	15,000	23,150	6,300	627,530	192,000	300	.....
Natchez	82,588	14,226	3,900	255,245	601,200	375	.....
Vicksburg	156,884	122,763	8,600	389,560	614,400	580	.....
North Carolina:							
Asheville	20,000	.....	14,400	120,000	40,320	800	.....
Charlotte	14,600	.....	1,350	543,000	(?)	675	25
Greensboro	18,390	.....	10,700	267,600	(?)	.....	.....
Raleigh	26,676	2,000	19,750	203,750	(?)	250	.....
Wilmington	421,700	59,000	8,400	547,000	(?)	.....	40
South Carolina:							
Charleston	900,000	600,000	25,214	1,063,415	1,341,600	.....	.....
Columbia	218,540	50,000	27,300	253,680	357,696	400	.....
Tennessee:							
Chattanooga	425,040	88,380	74,000	773,742	1,992,000	2,200	50
Knoxville	50,000	5,000	46,700	400,000	105,600	2,000	25
Memphis	1,314,420	416,100	107,300	4,000,000	1,805,760	8,500-9,000	75
Nashville	248,100	.....	98,000	1,146,200	168,000	.....	.....
Texas:							
Austin	1,000	.....	25,000	530,000	144,000	.....	.....
Dallas	350,000	10,000	79,490	750,000	768,480	2,000	.....
Fort Worth	531,250	186,730	53,500	650,000	566,400	1,600	.....
Houston	908,460	515,608	59,700	1,037,540	2,231,136	.....	.....
Galveston	878,000	164,500	50,000	791,300	960,000	1,120	.....
San Antonio	116,660	.....	54,000	682,870	703,200	4,000	.....
Waco	27,500	.....	16,000	450,000	315,216	.....	33
West Virginia:							
Charleston	286,720	125,000	25,214	430,000	480,000	600	.....
Virginia:							
Charlottesville	20,000	5,000	20,050	75,000	33,600	.....	.....
Lynchburg	40,000	.....	87,220	245,000	72,960	800	.....
Norfolk	2,250,000	1,500,000	113,414	4,000,000	(?)	2,000	.....
Portsmouth	150,000	150,000	12,700	100,000	(?)	600	.....
Richmond	750,000	300,000	376,118	2,000,000	1,200,000	5,000	.....
Total	23,434,941	7,162,701	3,361,483	41,582,545	42,560,688	.....	.....

[a] Consumed.

[b] St. Augustine included in Jacksonville report.

TABLE 5.—*Wholesale and retail prices of dairy products handled in 50 southern cities, fiscal year 1905–6.*

City.	Milk.			Cream.			Butter.		
	Paid to producer, per gallon.	Retail, per gallon.	Retail, per quart.	Paid to producer, per gallon.	Retail, per quart.	Fat.	Creamery, per pound.	Dairy or country, per pound.	Renovated per pound.
Arkansas:	*Cents.*	*Cents.*	*Cents.*		*Cents.*	*Per ct.*	*Cents.*	*Cents.*	*Cents.*
Fort Smith	11½–15	25	7–8⅓	$1.00	35	.....	35	25	20–25
Little Rock	12½–15	20–25	6⅔–8⅓	$0.80–1.00	30 40	20 30	30–35	25	25
Alabama:									
Birmingham	15–20	20–25	8⅓–10	.80–1.00	40	30	30–35	25–35	25–30
Mobile	.....	25–30	8⅓–10	2.00 1.25	.....	26 20	30–35	.....	25–30
Montgomery	.....	18–20	6⅔–8	.80–.90	40	20	33	25–30	25–30
Florida:									
Jacksonville	.....	25–30	8–10	.....	40	.....	33–35	.....	28–30
Pensacola	.....	35	10	.....	40	.....	.....	.....	.....
St. Augustine	.....	32	10	1.20	40	30	35–40	.....	25
Tallahassee	.....	.....	8⅓–10	.....	40	.....	35	25–30	.....
Tampa	25–27	35	9–10	1.00	40	20	35	35–40	30
Georgia:									
Atlanta	20–25	30	8⅓–10	.....	30–40	.....	30–35	25–40	.....
Augusta	.....	25	10	1.00	40	25	32–35	30	30
Macon	.....	.....	8⅓	1.00	40	25	33	25–30	.....
Savannah	.....	25–30	8⅓–10	2.00	50–60	.....	35	25–30	25
Valdosta	.....	30	10	.....	25	.....	35–40	25–35	.....
Kentucky:									
Covington	.....	.....	6–8	.80	24–30	.....	.....	25–30	.....
Lexington	.....	.....	6–8	.60	30	20	30–40	.....	25–30
Louisville	11–15	.....	7½–10	.60	30 25	25 20	30–35	12–30	27
Newport	18–20	25	7–8	.70	24–30	.....	30–35	25–30	25
Louisiana:									
Baton Rouge	.....	25	10	.....	40	.....	30–35	.....	.....
New Orleans	14–16	20–25	7½–10	.80	30–40	20	32–35	30	.....
Shreveport	.....	30	7½–10	.....	50	25	35–40	25–30	.....
Mississippi:									
Jackson	.....	25	7½–10	.75	25	.....	30–35	15–30	.....
Meridian	.....	.....	10	1.00	.....	.....	35–37½	15–30	.....
Natchez	.....	25	8–10	1.00	40	.....	37½	25–30	.....
Vicksburg	.....	24–32	8–10	.90–1.20	.....	.....	28–35	18–25	.....
North Carolina:									
Asheville	.....	20–25	7–10	1.00 1.50	.....	18–20 30	30–35	25–30	.....
Charlotte	15	25	10	1.20	40	.....	35–40	7–35	15–30
Greensboro	.....	17–20	6–10	.90–1.25	25–40	.....	30–35	12–30	25
Raleigh	.....	25	8⅓–10	1.00	50	25–30	30–35	25–35	.....
Wilmington	.....	.....	10–12	2.00	50–60	.....	30–40	25–30	25–30
South Carolina:									
Charleston	20–24	.....	8–10	.....	60	30	30–35	25	25
Columbia	.....	24	7–10	.....	50	.....	28–35	10–30	25–30
Tennessee:									
Chattanooga	13–17	25	7–8⅓	.80–1.00	35	20	35	20–25	25–30
Knoxville	.....	20–25	7–8	.....	32	20–22	30–35	25–30	.....
Memphis	14–17	.....	7–10	.....	25	20	35	25	25
Nashville	13–18	.....	5–8	1.00	25–30	12½–30	30	28	.....
Texas:									
Austin	.....	20–25	5–7½	1.00	.....	.....	30–35	10–30	.....
Dallas	.....	20–25	8⅓	1.00–2.00	40	35	30–35	25–35	25
Fort Worth	.....	20	7	1.00	30	25	27–30	8–30	20–25
Houston	.....	20–25	7½–10	.75–1.20	.....	.....	30–35	20–30	.....
Galveston	.....	.....	6–10	.75–1.00	.....	.....	35	25–30	30
San Antonio	15–18	25	7–8	.75	30–40	25	25–35	10–30	15–30
Waco	.....	.....	5–7½	1.00	25	.....	30–35	10–30	.....
West Virginia:									
Charleston	.....	25	8–10	.....	30	.....	30–40	25–30	.....
Virginia:									
Charlottesville	.....	24	6–8	1.00	30	15	30–35	20–25	.....
Lynchburg	.....	.....	10	.....	25	.....	33	20–25	.....
Norfolk	.....	.....	10	.....	40	.....	30–35	30	30
Portsmouth	.....	25	8–10	.80–1.00	40	.....	.....	.....	.....
Richmond	15–19	24–28	7–10	.85–1.00	40	25	35	15–35	.....

TABLE 5.—*Wholesale and retail prices of dairy products handled in 50 southern cities, fiscal year 1905–6*—Continued.

City.	Oleomargarin, per pound.	Cheese.		Ice cream.		Buttermilk, per gallon.	Skim milk, per gallon.
		Retail, per pound.	Wholesale, per pound.	Retail, per gallon.	Wholesale, per gallon.		
Arkansas:	*Cents.*	*Cents.*	*Cents.*			*Cents.*	*Cents.*
Fort Smith	15–25	20–25	17	$1.00	$0.70	10–12	10–12
Little Rock	15–25			$1.00–1.50	.65– .85	12½–15	10
Alabama:							
Birmingham	15–25	20	16	1.50	.70– .90	10–15	10–12½
Mobile	15–25	18–20		1.25–2.00	1.00	10–12½	10–12½
Montgomery	15–25	19–20	14–15	1.00–1.25		10–15	10–15
Florida:							
Jacksonville	20–25	20		1.50			
Pensacola				2.00			
St. Augustine	15–25	20	15	1.20			
Tallahassee		20	15	1.50		10	10
Tampa		20		1.50	1.00	20	20
Georgia:							
Atlanta		20		1.50–3.00		15	12½
Augusta		17½–20		1.50		12–15	
Macon	20	20	14½	1.25–2.00	.80–1.15	10–15	No sale.
Savannah		20	15				
Valdosta		20	15	1.60	1.20	15	
Kentucky:							
Covington						10	10–12
Lexington	15–25	20	15–16	1.00	.75– .85	10	10
Louisville	12½–25	18–20	16			15	15
Newport	15–22½			1.50	1.00	10	10–12
Louisiana:							
Baton Rouge	15		15	1.50	1.00	20	15
New Orleans	15–25	20–25	15	1.50–2.00	.75–1.00	10–12	
Shreveport		20–25	14–17½	1.25–2.00		15	
Mississippi:							
Jackson	20–25	20	16	1.25–2.00	1.00		
Meridian		20–22½	15–16	1.50–2.00			
Natchez		20	16½	1.25–2.00			
Vicksburg	15	20					
North Carolina:							
Asheville		20			.80–1.25	10	10
Charlotte	15–20	17½–20		1.30–1.50	1.00	10	15
Greensboro		20		1.00		10	10
Raleigh	15–20	17½–20		1.00–2.00		15	
Wilmington		20	15	1.50	1.00	20	20
South Carolina:							
Charleston	15–25	20–22		1.40			
Columbia		20	16	1.50		10	
Tennessee:							
Chattanooga	25	20	15–16	1.25–1.50	.75– .90	10–15	4–10
Knoxville	20	20	14–15	1.00–1.25	.75–1.00	10	5–10
Memphis	20–25	20	14–15	1.25	.70–1.00	10	10
Nashville	25	20	15	1.00–1.50	.75– .90		
Texas:							
Austin		20	15–16			10–15	10
Dallas		20	15	1.00–2.00	.75–1.00	10–12½	
Fort Worth	12½–25	20	16	1.00–1.50	.75–1.00	10	12½
Houston	15–20	17½–20		1.00–2.00		15–20	5–6
Galveston		18–25		1.25	.75–1.00	15–20	12½
San Antonio		20		1.00–1.50	.70– .80	12–15	10
Waco				1.00	.50– .70	10	5
West Virginia:							
Charleston	15–25	15–20		1.25		15	
Virginia:							
Charlottesville	12½–20	20	15	1.00–1.25	1.00	10	10
Lynchburg	15	20	14–15	1.50	1.00	15–16	
Norfolk	15–32	18	14	1.50–2.00	.65–1.00	20	
Portsmouth				1.00–1.50			
Richmond	15–25			1.50	1.00	14	

THE MILK SUPPLY OF SOUTHERN CITIES.

By GEORGE M. WHITAKER,
Inspector, Dairy Division.

PRODUCTION.

Most of the milk supply of southern cities is produced within a few miles of the place of consumption. Many herds are kept within the thickly settled portions of the cities, where land is expensive. This generally means overcrowded stables, poorly lighted and ventilated, with contracted yards for exercise, filthy at all times, and almost knee-

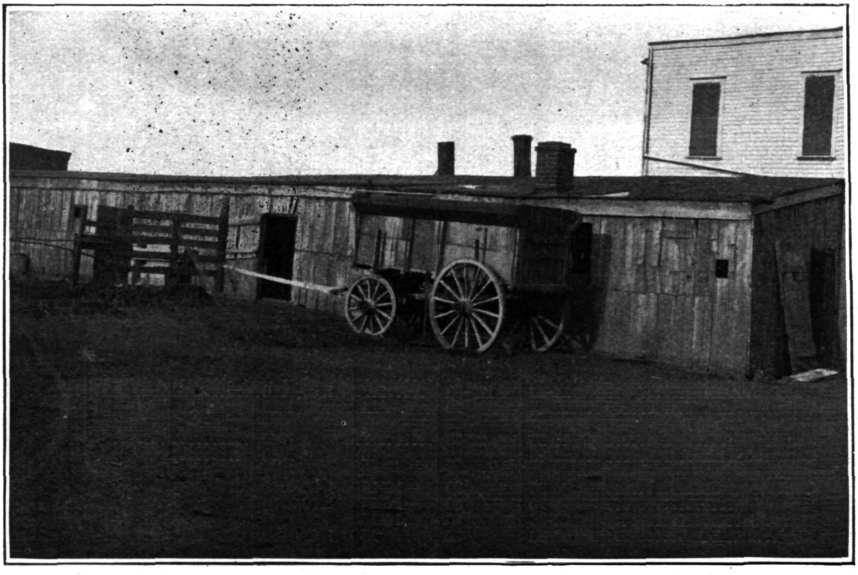

FIG. 53.—Cow stable in southern city, showing poor lighting and ventilation.

deep with mud after a rain. The feed used in these dairies is largely such as does not call for much storage space and is influenced to some extent by local conditions of production. Many city herds are fed nothing but cotton-seed meal and hulls. In some instances wheat bran is added. In cities where distilleries are located distillery slop is fed, though the trend of city ordinances is in opposition to this. Where there are breweries, brewer's grains are prominent in the dairy ration. Sometimes the grains are reduced to a thin slop with warm water. On account of the readiness with which the grains ferment some health boards prohibit the use of wet grains.

As the dairies are farther removed from the thickly settled portions of the cities to locations where land is less valuable the cows get more green feed in season, according to conditions. In some places a small

bunch of green fodder of some kind may be fed in the manger; in others the cows may be allowed an hour's run each morning in a field of growing wheat. At still greater distances increasing amounts of green fodder are fed, though soiling as a system has made but little progress, and where the land is within an easy drive of the city and cheap enough there is some pasturage.

CARE OF MILK AT DAIRY.

Generally speaking, milk is not properly cooled by producers. The use of ice is unknown among the ordinary dairies. Some producers run the milk over a cooler supplied with spring water of a temperature rarely below 65° F. and frequently as high as 75°. Others set

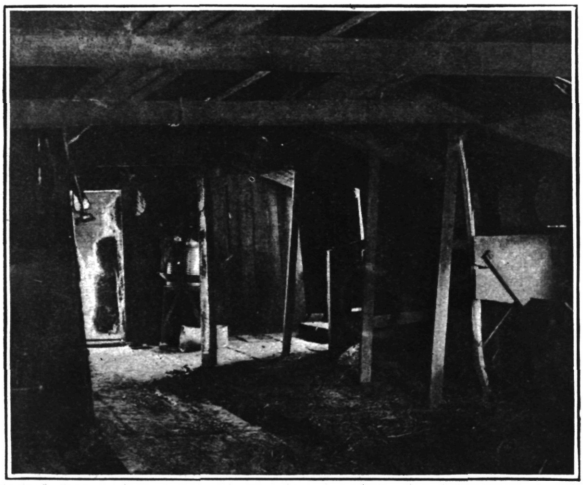

FIG. 54.—Insanitary location of milk cooler in barn.

the cans of milk in tanks of spring water or in the running spring water. Other dairymen make no pretense of cooling the milk and can or bottle it for market at the natural animal temperature. The cooler, when used, sometimes stands in the stable (fig. 54), and frequently the milk is strained into the shipping cans behind the cows. Bottling is often done in rooms connected with the stable or in places where cleanliness is impossible (fig. 55).

Because the climate is generally mild and at times very warm much work is done out of doors. This frequently results in insanitary ways of handling milk utensils and the milk itself. For instance, when water for cleansing utensils and bottles is heated in an old pail set up out of doors on a few loose bricks the presumption against proper sterilization of milk receptacles is strong at that dairy. Many dairies were found where the "milk room" was an open porch of the

dairyman's residence (fig. 56), sometimes very disorderly and sometimes also the place where most of the domestic kitchen work is done, and in one case where hens were sitting. Milk receptacles will hardly be cleansed in a sanitary manner under such conditions, to say nothing of the exposure of the milk to impure air in straining and bottling.

DISTRIBUTION.

Most of the milk supply is retailed and distributed by the producers. Very little milk is transported by railroad in the South, and comparatively few cities have milk plants or depots owned by middlemen. Such establishments are found, however, in Macon, Atlanta,

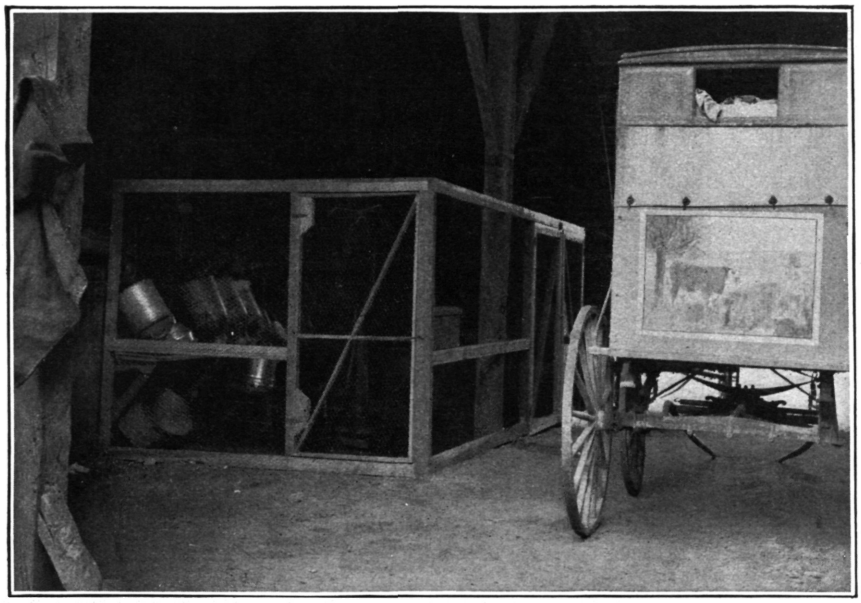

FIG. 55.—Milk room made by partitioning off with wire netting a corner of wagon house.

and Savannah, Ga.; Asheville, N. C.; Richmond, Va.; New Orleans, La.; Knoxville and Memphis, Tenn.; San Antonio, Fort Worth, and Austin, Tex., and Fort Smith and Little Rock, Ark. Nearly all of the establishments in these cities pasteurize their entire output. Most of the milk is bought by the gallon, but some buy on a butterfat basis. In Savannah and Memphis the establishment of the plants grew largely out of a movement on the part of the producers to relieve themselves of the expense and trouble incident to doing a retail business. On account of climatic conditions two deliveries a day are frequent, milk often reaching the consumer less than five hours old. Bottles are used to a limited extent. (See Table 4, p. 315.) The custom of dipping milk from the open can prevails somewhat, and in many instances milk is drawn through faucets from large carriers.

In a few cases the milk is poured from a two-gallon can provided with a cover which is also a measure, and in a few cities it is delivered in a varied assortment of tin cans and earthen jugs. Milk is usually delivered from wagons built especially for the business. In New Orleans high two-wheeled carts are used, the carrier faucet-cans being placed in the front part.

QUALITY.

The quality of the market milk is generally satisfactory so far as amount of milk solids is concerned. In many instances it is much above the legal requirement. The Memphis city chemist says that

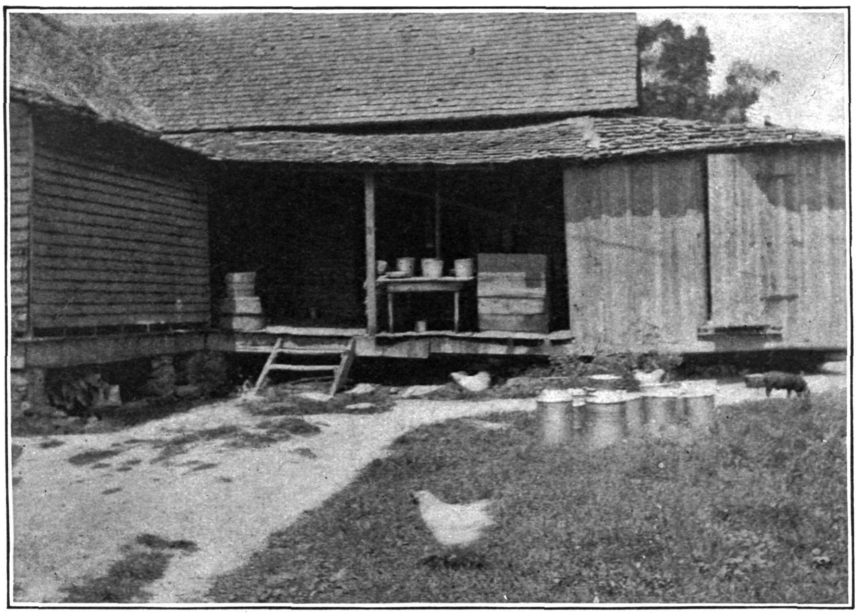

FIG. 56.—Porch of residence used as milk room; utensils drying and airing on lawn amid chickens and pigs.

the milk supply of that city will average from 4.5 to 5 per cent of fat. Jersey blood is prominent among the dairy herds.

As regards cleanliness and freedom from bacterial contamination the South has its share of the ignorance and negligence to which is due so much unsatisfactory market milk. In addition to this, some climatic and economic conditions have a peculiarly unfavorable bearing. Many producers are renters, doing a small business and struggling hard to make a living. Frequently they have poor barns and milk houses as well as inadequate facilities for handling the milk and washing the utensils. (See figs. 57 and 58.) In many cases the wife

and children have to lend a hand in the dairy work. All these conditions are not only bad in themselves, but they have a tendency to crush any ambition to improve. The scarcity of ice prevents the proper cooling of much milk. Considerable quantities are therefore handled and sold at a high temperature, promoting rapid increase of bacteria.

A certified milk commission exists in Louisville, Ky.

PRICE, SUPPLY, AND DEMAND.

In many cities 10 cents a quart is the prevailing retail price of milk to the consumer. In some places only a few of the better dairies get

FIG. 57.—Residence of small dairyman containing milk room; milk cans exposed to chickens.

10 cents a quart, while many of the others take any price that is offered—as low as 5 cents a quart in a few instances. A common price is 6¼ cents a quart, 4 quarts for 25 cents.

Generally speaking there is no oversupply, and in many places milk is actually scarce at times. In spite of this complaints are made of the competition in the business, chiefly among dairymen whose conditions are ordinary to poor. Prices are frequently cut where the ticket system prevails by giving a few extra tickets for a dollar. Twenty-eight pint tickets for $1 is a common price, which is about 7.2 cents per quart; but in some instances the thrifty housekeeper by skillful

bargaining can get 30 or even 32 tickets, the dealer insisting that his price remains at 28 tickets and that the extra ones are a gift. Complaint is made in some places, notably Memphis, of uneven production, and of competition from small summer dairies in which the cows are milked for only such time as they can be kept on pasture. This "grass milk," cheaply produced, is sold at almost any price, and depresses the market for a few weeks each year, leaving some of the regular all-the-year dairies with a temporary surplus.

In some places there is a shortage, which compels the use of much condensed milk. Some of the large hotels are compelled to keep a

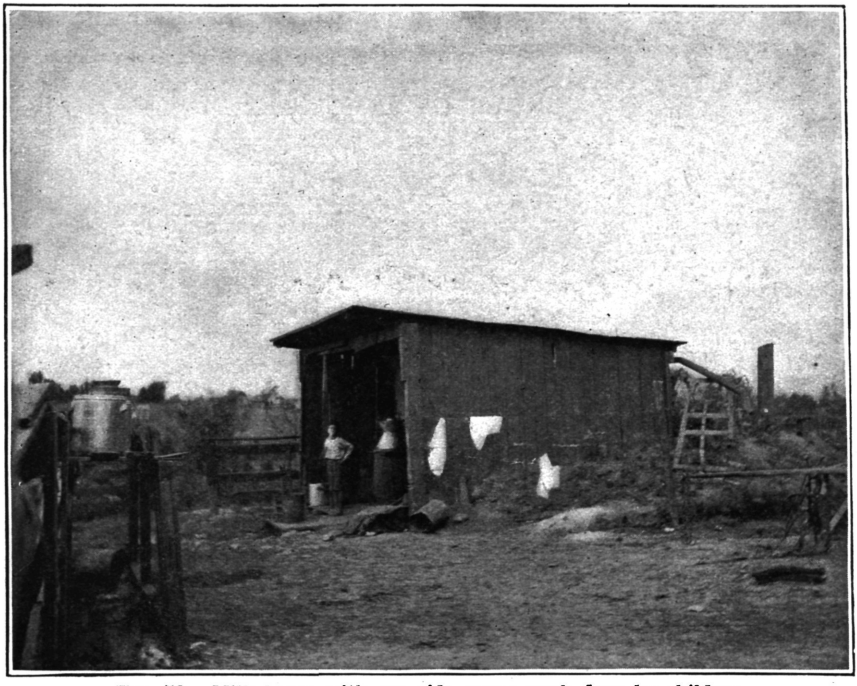

FIG. 58.—Milk house with one side open; work done by children.

stock of condensed milk on hand to be sure of an ample supply. In Florida complaints came to the writer from consumers concerning the inadequacy of the supply and the resultant independence of the milk producers and dealers. If a dealer happened to be short some morning and obliged to skip a few customers, they would not dare to complain, lest he might be offended and refuse to bring them any more milk. One Jacksonville business man with a "bottle baby" had milk delivered in the morning by one milk man and in the evening by another—double what he needed—to insure a supply should one or the other happen to omit his regular call.

INSPECTION.

Many cities have milk ordinances, though in not a few cases very little is done to enforce them. In some cities the collection of license fees and the issuance of permits for the sale of milk is the extent of milk inspection. Many cities had no inspection of any kind until a short time ago.

During the past year a campaign for better milk was taken up in Texas by a leading magazine. Representatives of the publication were sent to the seven largest cities of the State, and samples were taken of the milk as delivered by the dairymen. Thirty-five out of 53 samples, or 66 per cent, were found to contain preservatives. Some

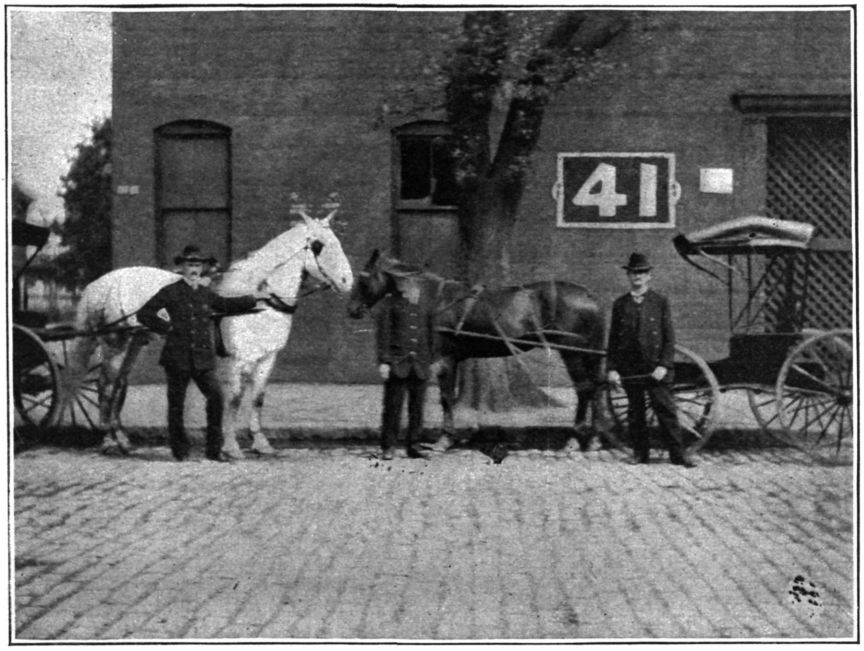

FIG. 59.—Uniformed milk-inspection corps, Atlanta, Ga.

of the samples were also low in butterfat, indicating the addition of water or partial skimming. Within a few weeks after the publication of the magazine article showing these facts the municipal authorities in several of the cities began a warfare against adulterated milk.

Where ordinances have been in existence and have been enforced, the work under them has related largely to securing evidence of the sale of adulterated or under-standard milk, and in some places excellent work has been done along these lines, greatly improving the composition of the city supply. But in at least one city, where the custom of drawing milk from large cans prevails, samples are taken only from those carriers, and no effort is made to sample milk as delivered

to the consumer, though it is a matter of common knowledge that this manner of distribution results in a very uneven product, many customers getting only skim milk.

The sanitary side of dairy inspection has received too little attention, but a gradual improvement in this direction is noticed. In Charleston, S. C., a code of laws was recently adopted and a milk inspector appointed. Considerable attention is given to the sanitary inspection of stables and methods of handling milk, with encouraging results. In Savannah, Ga., an outbreak of typhoid fever, traceable to a leading dairy, has called attention to the importance of supervising the milk supply, and an agitation for more inspection is under way. In Asheville, N. C., a milk inspector was recently appointed, and already there has been a radical cleaning up of some of the worst stables and an improvement in others. In Nashville and Memphis, Tenn., the county health officers have taken a new interest in the sanitary inspection of the dairies under their jurisdiction. Columbia, S. C., is agitating for milk ordinances and inspection. The Galveston, Tex., health office now gives a special certificate to all dairies whose apparatus, dairy rooms, and herds come up to a certain standard of cleanliness. Atlanta, Ga., has uniformed milk inspectors, who are furnished with buggies. (See fig. 59.) This city has recently adopted radical ordinances and greatly improved its milk supply. These ordinances, among other things, provide that—

All milk shall be strained as soon as milked.

All milk must be offered for sale as milked from the cows, and shall not be passed through cream separators or other apparatus other than strainers for the purpose of removing manure, dirt, or other substance.

All milk shall be marketed as soon as possible after milking.

It shall be unlawful for any person to bring or receive into the city of Atlanta, for sale, or to sell any milk which contains any manure or dirt (that is, in quantity sufficient to be detected with the naked eye after milk has been standing for one hour or more).

In Louisville, Ky., the activity of the State food inspection officials has succeeded in prohibiting the sale of milk from swill-fed dairies in that city. This war against milk from cows fed on distillery slops has had a good effect upon the milk supplies of the other cities of that State.

COST OF PRODUCTION.

Several factors tend to increase the cost of producing milk in the South. In the first place, but little attention seems to be given to keeping dairy cows which produce large amounts of milk, consequently few cows are kept which are large producers. In some instances Jersey blood predominates, but of families which are small producers, even though Jerseys. Many herds were found giving only about 5 quarts per day per animal. In other cases cows of the beef

type are bought at the stock yards when about to freshen; these are milked through one period of lactation, then fattened, and sold for beef. Rarely does one find a herd of cows of dairy type selected or bred for the largest possible production of milk with 3.5 to 4 per cent fat.

Secondly, considerable work is done in an uneconomical manner. On account of the warm climate two deliveries per day are frequent, which means doubling this item of expense. The double time of man and team, and wear and tear of horse and wagon, must frequently more than offset the saving of ice, to say nothing of the inferior

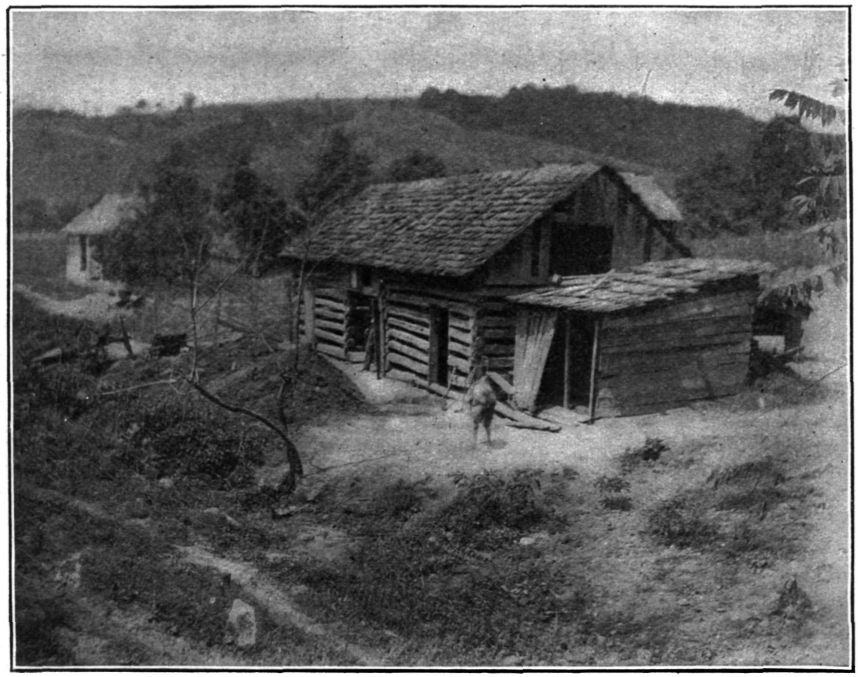

FIG. 60.—Stable affording inadequate protection to cows during inclement weather.

quality of the product. When milk is cooled in a spring the spring house is often at a distance from barn and residence, necessitating many additional steps and increasing the cost of production. The saving of steps seems to be an idea impossible for many persons to grasp.

Thirdly, many southern dairy barns are unsuited for the most profitable production of milk on account of the fact that cows can not be kept comfortable in them at all times. In a country where much of the winter weather is mild the dairyman is apt to overlook the fact that even a brief chill to the delicate organism of a sensitive dairy cow damages the animal and shrinks the milk flow, which may

be very expensive; the full flow of milk may not be regained for months. Consequently, where the temperature may drop as low as 40° F. even for only a few days in the year, or where damp chilly winds may bring discomfort to unprotected cows, even though for only a few hours, the stables should be so constructed as to protect the animals from the full force of the elements; otherwise the production is liable to drop in amount at almost any time. (See figs. 60 and 61.) Figure 62 illustrates a good type of southern barn which affords

FIG. 61.—Interior of stable which does not protect cows against bad weather.

protection against inclement weather and at the same time provides light and ventilation.

BUTTERMILK.

Large quantites of buttermilk are consumed in southern cities—Birmingham, Ala., being notable in this respect. It is everywhere popular as a beverage, and is always on the menus of hotels and restaurants; it is also used extensively in cooking, many families buying it by the gallon. The price ranges from 10 to 20 cents a gallon, 13 cents being about the average. In a number of places it is claimed that nearly as much buttermilk is consumed as whole milk, but exact figures as to the consumption of buttermilk can not be obtained. Many buttermilk dealers have small dairies of 2 to 6 cows and go to

market at irregular intervals with varying amounts of butter and buttermilk, and some cities do not require permits for the sale of buttermilk, hence there is much difficulty in determining the amount consumed.

Buttermilk dairying is popular with some producers, who claim that the income from the buttermilk and butter is almost as much as from whole sweet milk, without the necessity of daily delivery, the annoyance of inspection, and the expense of keeping the dairy up to the standard of cleanliness required for a sweet-milk dairy. But health officers are giving increased thought to buttermilk dairies,

FIG. 62.—A good type of southern barn.

and doubtless in the near future a more careful buttermilk inspection will be demanded. Complaints of ptomaine poisoning alleged to have been due to buttermilk have come from Nashville, Tenn., and elsewhere.

OPPORTUNITIES FOR IMPROVEMENT.

The southern market-milk situation is capable of much improvement. The dairymen can reduce the cost of production very materially by keeping cows better adapted for market-milk production, by studying economy of labor, and by using more cheap home-grown feeds suitable for milk production. Again the situation is capable of great development by an increased consumption. The per capita

milk consumption in the South is below the average for the country. The per capita daily consumption of milk in the United States is estimated at about two-thirds of a pint; in Boston, Mass., it is eight-tenths of a pint; and as high as 1 pint is reported from some cities. On the other hand, in most southern cities the daily consumption is less than half a pint, and as low as one-third of a pint is named in some places. This showing may be somewhat misleading because of the large amount of buttermilk used, which doubtless takes the place of some sweet milk; but even if liberal allowance is made for this, the fact remains that the South consumes less than the average amount of milk. Moreover, the use of cream, of which large amounts are consumed in the North, is almost unknown in the South.

Several reasons for this low per capita consumption of milk and cream can be given: Indifference as to the food value of milk, an inherited habit of using milk in small quantities, an insufficient supply, suspicion of the purity of the product, and the large negro population. The latter consumes little or no milk, but materially increases the divisor to be used in ascertaining the per capita consumption. The last-named factor is, of course, purely sectional; but as regards the others, experience in different northern cities and towns has shown that an abundant supply of milk of unquestioned quality tends to increase the amount that is used; also that a campaign of education among producers helps consumption. Hence we may assume that when the milk supply of southern cities is improved by means of better sanitary inspection, and when the public realizes that an ample supply of clean, safe milk can be obtained, increasing amounts will be consumed.

Here is another opportunity for improving the condition of the southern dairyman. As the public is educated to realize the difference in the way that good milk is produced as compared with the inferior article, there will be a willingness not only to consume more of that which is produced in the proper manner, but also to pay a higher price for it, as for a high-grade article. Already in Memphis and Nashville, Tenn., Asheville, N. C., and other places some dairies easily get 1 to 4 cents a quart more than others receive merely because the public has confidence that the product is pure and clean.

WHY DAIRYING IS UNDEVELOPED IN THE SOUTH.

By B. H. Rawl,
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CONSUMPTION AND PRODUCTION.

The extent of the market for the various kinds of dairy products in the South has been shown in Table 4, page 315, where data are

given from 50 cities distributed throughout 13 States. The amounts of dairy products mentioned in Table 6, which are handled in these 50 cities are far greater than the total amounts of those products produced in the 13 States in which the cities are located. The extent of production in these States and the difference between this home supply and the market demand are shown in the table below. This table is a partial summary of Table 4, with some additional matter:

TABLE 6.—*Products handled in 50 southern cities, and estimated financial gain if produced at home.*

Product.	Quantity imported into 50 southern cities.	Amount produced in 13 Southern States.[a]	Average retail price.	Value of imported product.	Cows needed to supply deficiency.[b]	Cost of keeping cows at $45 a year.	Estimated profits that could be saved to the South.[c]
	Pounds.	*Pounds.*	*Cents.*	*Dollars.*	*Number.*	*Dollars.*	*Dollars.*
Creamery butter	23,434,941	890,768	33½	7,850,705	69,747	3,138,615	4,712,090
Renovated butter[d]	7,162,701	33,260	26	1,862,302	21,317	959,265	903,037
Cheese	41,582,545	782,000	20	8,316,509	69,304	3,118,680	5,197,829
Condensed milk[e]	42,560,688	.....	10	4,256,069	14,187	638,415	3,617,654
Oleomargarin[f]	3,361,483	522,900	20	672,297	10,004	450,180	222,117
Total	.....	.....	.....	22,957,882	184,559	8,305,155	14,652,727

[a] Census of 1905.
[b] Cows giving 6,000 pounds of milk or 336 pounds of butter.
[c] Cost of manufacture not deducted.
[d] Report of 39 cities.
[e] Report of 49 cities.
[f] Report of 40 cities; amount consumed in the 13 States, 6,766,221 pounds.

It will be noticed from the above table—

1. That the value of the dairy products shipped into these 50 cities (not including similar products that are shipped into other cities of those States) is $22,957,882, or an average of $459,157 per city.

2. That 184,559 cows, each giving 6,000 pounds of milk, or 336 pounds of butter, would be required to produce these products.

3. That after allowing $45 per cow for the cost of feed there would still remain, on the basis of retail prices given in Table 5, a profit of $14,652,727, or an average of $293,054 per city (cost of delivery not considered).

4. That 12,304 dairy farms, or an average of 246 farms per city, with 15 cows of the kind above named on each farm, would be required to supply these products.

5. That after allowing for the cost of the feed at the rate above given there would remain a profit of $1,191 per farm (the by-products of the dairy—calves, manure, skim milk, etc.—paying for the labor).

6. That each of these farms would require two men to operate it, hence giving profitable employment to 24,608 men, or an average of 492 men per city.

7. That since these dairies would greatly facilitate the growth of all kinds of crops, their development would tend to increase rather than decrease other agricultural products in that section.

There are hundreds of farmers throughout the South, each of whom could add a 15-cow dairy to his farm, and could besides in a

short while easily produce more of other crops than he is producing at present.

WHY SOUTHERN DAIRYING IS UNPROFITABLE.

Dairying is undeveloped in the Southern States largely because the farmers of that section do not understand how to make it profitable. They realize the necessity of more fertilizer for their farms, and they are buying large quantities of it at high prices. They realize, too, that barnyard manure is superior to commercial fertilizer, but they do not understand how to keep the cattle to make the manure without sustaining a loss on the cattle.

This is due principally to three things: (1) The cattle now kept are, as a rule, inferior and could not be kept profitably under any circumstances; (2) many dairymen buy practically all their feed instead of growing it, especially those who live near the city and can get a good price for their products, and (3) the dairyman who lives some distance from the city and sells butter as a rule makes an inferior product. A very large per cent of the dairies in the Southern States are suffering from at least two of these difficulties and in many cases from all three.

LOW AVERAGE PRODUCTION PER COW.

In the 13 States named in Table 4 the average cow, according to the census of 1900, produces annually only 3,036 pounds of milk, which it is estimated will average 4.8 per cent of butterfat, and will therefore make 145.7 pounds of butterfat, or about 170 pounds of butter. In the following two tables the returns from this average cow are compared with the returns from a good cow. The standard adopted for the good cow—6,000 pounds of milk, making 288 pounds of butterfat—is reasonable, since in many herds in the South each cow in the herd has exceeded it in her average.

The tables show the average amount received under each of the three methods of marketing commonly used in that section. The prices given are averaged from Table 5.

TABLE 7.—*Estimated profits derived from an average southern cow under three methods of marketing.*

Method of marketing.	Milk produced.	Average price.	Amount received.	Cost of feed.	Profit.
	Gallons.				
1. Producer sells whole milk retail....	353	8.6 cents per quart....	$121.43	$40	[a] $46.13
2. Producer sells whole milk to dealer.	353	17 cents per gallon....	60.01	40	20.01
3. Producer sells dairy butter—[b]					
145.7 pounds butterfat making 170 pounds butter.....	.....	25.8 cents per pound..	43.86	.....	.....
Leaving 2,890 pounds skim milk.	.....	20 cents per 100 lbs.[c]..	5.78	.....	.....
Total receipts from butter making.....	.....	.....	49.64	40	9.64

[a] After deducting $35.30 for cost of delivery at 10 cents a gallon.
[b] Using 4.8 per cent as fat test.
[c] Estimated value for feeding purposes.

TABLE 8.—*Estimated profits derived from a good cow under same three methods of marketing given in Table 7.*

Method of marketing.	Milk produced.	Average price.	Amount received.	Cost of feed.	Profit.
	Gallons.				
1. Producer sells whole milk retail	[a] 698	8.6 cents per quart....	$240.11	$45	[b] $125.31
2. Producer sells whole milk to dealer.	698	17 cents per gallon....	118.66	45	73.66
3. Producer sells dairy butter—[c]					
288 pounds butterfat making 336 pounds butter	.....	25.8 cents per pound..	86.69	.....	.....
Leaving 5,712 pounds skim milk.	.....	20 cents per 100 lbs.[d]..	11.42	.....	.....
Total receipts from butter making.....	.....	.....	98.11	45	53.11

[a] Six thousand pounds or 698 gallons.
[b] After deducting $69.80 for cost of delivery at 10 cents per gallon.
[c] Using 4.8 per cent as fat test.
[d] Estimated value for feeding purposes.

Dairying is to a large extent restricted to an area around the cities. Table 7, which represents actual conditions, will show the cause of this fact. The average cow in a dairy herd located so that the milk can be delivered direct to the consumer earns $46.13 a year, after paying for feed and delivery; if this cow's milk is made into butter she earns $9.64 after paying for feed (no allowance being made for labor in either case). From these facts the average dairyman would decide that supplying retail milk is the more profitable. As a matter of fact there is little profit in either one. The man who is retailing milk often has no farm, therefore has no use for manure and does not take care of it, and being located near the city labor is more expensive. The man who sells butter perhaps has a farm, and therefore his feed may cost less than $40 per cow; then, too, if he clears nothing more than the manure, this may enable him to make his farm very profitable for other things; such cases are not uncommon.

In cases where milk is sold wholesale (2, Table 7) it would appear that some advantages exist.

In such cases the dairymen usually own farms, and a few of them have made money. Still there are disadvantages to be contended with. The profit is greater than in butter making (3, Table 7), but no allowance is made for expense of shipping, there is no skim milk, and on the whole perhaps no more can be said for this class than for the other two. They are all to a large extent failures.

Where, then, are the successful dairies found? They are the classes represented in Table 8. In this table each of the classes has an excellent showing for a profit, if reasonably good business methods are used.

In comparing Table 8 with Table 7 it will be seen that in the former $45 is allowed for the cost of feed, as against $40 in Table 7. If the methods used in both cases were the same the difference should perhaps be greater; in other words, $40 would probably be more than is necessary to feed the average cow. But it is safe to assume that

such is not the case, because the man who does not know enough to keep cows that are above the average, as a rule, does not know enough to feed them most economically.

In continuing this comparison it will be noted: (1) That after allowing for feed and delivery there remains from the retailing of the milk a profit of $125.31 in the case of the good cow, as against $46.13 for the average cow; (2) that after allowing for feed there remains from the wholesaling of the milk a profit of $73.66 in the case of the good cow, as against $20.01 for the average cow; and (3) that after allowing for feed and adding the value of the skim milk there remains from the sale of the butter a profit of $53.11 in favor of the good cow, as against $9.64 for the average cow.

DAIRY KNOWLEDGE IS NEEDED.

The question that naturally arises from a comparison of Tables 7 and 8 is, Why will any man keep such cattle as are represented in Table 7 when he can make so much more profit with better cattle, as shown in Table 8? There can be no answer other than that it is because of a lack of knowledge. According to the census of 1900 there were 4,097,961 cows in the States named in Table 4. These cows were annually producing 1,444,291,536 gallons of milk, or 596,203,546 pounds of butterfat. If these cattle were of the class shown in Table 8, they would produce 2,859,042,558 gallons of milk, or 1,180,212,768 pounds of butterfat; an increase of 1,414,751,022 gallons of milk, or 584,009,222 pounds of butterfat. Valuing this milk at the average wholesale price given in Table 5, this increase would be worth $240,507,674; or valuing the butterfat in this milk according to the wholesale rate in the table it would be worth $175,785,776.

In other words, the dairymen are annually losing not less than $175,786,776 because they are keeping cows that produce an average of 353 gallons of milk per annum instead of cows that will produce 698 gallons, or 6,000 pounds, per annum. This is too important an item for the dairyman to overlook; and it is certainly one of the most important causes of the present undeveloped condition of the dairy industry in the Southern States.

HOW TO GET GOOD COWS.

In considering this question, the source whence dairy cattle are obtained is of paramount consideration. It is true that the southern dairies are to a large extent in the vicinities of the cities, therefore, as has previously been shown, it is more profitable for them to sell whole milk. Skim milk as well as the facilities of the farm are lacking, consequently the raising of calves becomes a difficult and expensive operation. As a result the majority of such dairymen rely

entirely on the market for their supply of cattle. In the interior country districts there is usually very little dairying, hence the supply of dairy cattle in those districts is very limited. The stock yard therefore becomes the only source of supply of cattle for a very large proportion of the dairies. Cows that are in milk are purchased, and when they go dry they are again sent to the stock yard. This practice is one of the essential causes of the low average milk production of southern cattle.

But in addition to this practice, those who do raise dairy cattle usually breed their cows to inferior, scrub, or grade bulls, and ignore the performances of the individual cows. These customs will surely prevent any marked improvement of the herd. Three things are recognized as essential by all successful breeders of dairy cattle: (1) Systematic records should be kept of all cows so as to determine which are profitable; (2) a purebred bull, well selected, should be used; and (3) the heifer calves from the best cows only should be retained in the herd. Some of these heifers will prove to be inferior individuals, and should be disposed of; but if the system is consistently carried out it will produce gradual improvement in the herd, regardless of what grade of cattle was used to begin with.

But even this does not solve the problem for the man who has neither farm facilities nor skim milk with which to raise calves. What, therefore, can he do? First, under average conditions, he should either buy a farm or get out of the dairy business. This is particularly true of the Southern States, where so much feed can be produced at a comparatively small cost, and where good pastures can be maintained for a great part of the year. But when the farm has been procured, how will the skim milk be obtained which is so essential in raising calves? This is an important consideration, and can often be provided for in the following manner:

There is a great demand for sweet cream throughout the South, which is often either supplied from the North or remains unsupplied. It commands a very good price, and very often such cream will bring as much as the whole milk from which it was taken. Therefore a whole-milk business can often be converted into a sweet-cream business without reducing the income from sales, and thus the skim milk can be retained at little or no cost. Sometimes it may be best to separate the cream from only enough of the milk to provide a sufficient supply of skim milk for the calves, and then sell this cream to the same customers who buy the whole milk. Even if a small loss in the sales is at first sustained by this system, it must be remembered that good cows are absolutely essential to a profitable dairy and that the increased production which will result from this system will soon offset any loss that was sustained at first in putting it into practice.

FEEDING.

In order that cattle may produce the most milk and do it most economically, they must have suitable feed, not all of which can be obtained by buying on the market. Green feed is very essential, and when it is not available direct from the field it should be supplied in the form of silage. It is impracticable to go into a discussion of feed in this paper, but too much emphasis can not be given to the matter of preparing the right kind of feed. In many cases the cows are fed on nothing but cotton-seed meal and hulls. This is not only an expensive feed, but it is entirely insufficient to give the best results. When used in combination with silage and good hay, cotton-seed meal particularly can be used to good advantage. Another very bad practice in connection with feeding is that the cattle are often not fed enough. Many a good cow is producing far less than her maximum because of an insufficient amount of feed.

As mentioned elsewhere, the inclination of the dairyman to rely entirely upon the market for his supply of feed is a very great drawback to the dairy industry of the South, and is a bad practice in two ways: (1) It is impossible to supply entirely from the market the kind of feed that is best for the cows, and (2) even if a suitable feed could be obtained from the market, it would be more expensive than if grown on the farm. All rough feed, at any rate, and in some cases a part of the grain, can be grown to great advantage. With the great variety of forage crops, particularly legumes, that are available under southern conditions, the production of feed is neither difficult nor expensive, and yet in this section the dairymen are producing less feed than in almost any other part of the United States. The southern dairyman can never fully succeed until he produces more of his feed.

PASTURES.

Pastures can be made that will furnish good grazing for the greater part of the year. There are two reasons why pastures should be used liberally, namely, the long pasture season, and the cheap lands; yet comparatively few southern dairymen have proper pastures. The waste lands of the farms that are covered with ditches and pine saplings are often fenced, but no further improvement is made; hence such pastures are little better than useless.

INFERIOR BUTTER.

There is in the South a large amount of butter sold to the renovated-butter factories as packing stock. This as a rule does not come from the dairies, but much of the dairy output also would be thus sold if the butter market were as discriminating as it is in some sec-

tions. The above-mentioned packing stock is what is commonly called "country butter," and comes from farms where one or two cows are kept for family use, the surplus butter being sold to a near-by grocery store. The stores are compelled to purchase such butter to retain the trade of those who sell the butter. Often the stores can retail this butter at once to other customers, but what can not be disposed of in this way is packed in barrels and when a sufficient amount has accumulated it is shipped to some renovating factory. Thus it is that this country butter often sells for from 7 to 15 cents a pound when good butter is retailing at an average price of 33½ cents per pound (1907 prices). This discrimination on the part of the consumer is not against the producer, but instead is against an inferior article which the consumer will not accept, and which must, therefore, be sold as packing stock. This may seem like a very small item to the individual farmer who is producing such butter, but the practice is costing the farmers of the South in the aggregate an immense sum of money annually. The remedy for this practice is for those who are producing such butter to study the subject of butter making until a good article can be made. It is often true also that those who are producing packing stock are of the opinion that this butter is as good as can be made and that there is some other cause of such discrimination against their product. Every farmer who is conducting his work in a business-like manner must look after such details.

In Tables 7 and 8 butter production is shown to be the least profitable of the three kinds of dairying mentioned. But since this kind of dairying can be done anywhere, irrespective of the location of the market, it is by far the most important branch of the dairying of the South. When properly conducted it can be made very profitable, and there are a number of examples in various places that prove this. On these farms a dairy house suitably equipped for making butter on a small scale is provided at little cost, and when the proper methods are used excellent results are obtained. A small number of such plants are producing butter that always sells for the highest market price. When results are not satisfactory it is usually found that bad methods are practiced. It is hoped that the better kind of dairying will grow more in favor with the southern farmers.

HIGHER PRICES FOR BETTER MILK.

In the preceding article it is shown that the sanitary conditions surrounding the milk supply of many cities in the South are bad; hence dangerous milk is the result. There is now a great movement in progress throughout the whole country to improve the milk supply. To accomplish this it is often considered necessary that a

higher price be paid for a better quality of milk, because the cost of producing it is greater. While this is generally the case, it is notably true that in some cities where prices are highest the quality of the milk is poorest.

It is also true that very unprofitable dairies often get the same price for their product as very profitable ones that are operating under exactly the same natural conditions. While quality in milk must be appreciated by the consumer and paid for, still there is usually something needed in addition to higher prices.

SUMMARY.

Some of the improvements which the situation demands have been suggested in the foregoing pages, and these are briefly reviewed in the following summary:

1. There is no branch of agriculture that is more needed in the South than dairying. It is not only a profitable industry in itself, but it may be made the means of increasing the productiveness of the soil and promoting a better type of agriculture.

2. It is found that southern dairymen, as a rule, are not using the most economic methods in the following particulars: (*a*) The production of the average cow is only about half what it should be. (*b*) Too many of the dairies are in the cities, when they should be on farms; hence too high-priced feed and bad methods of feeding. (*c*) Milk and butter of poor quality are produced, which do not bring the highest prices.

3. It is strikingly true that in most cases where an inferior dairy herd has been in existence for some years it will be found that expensive methods are being practiced and an inferior grade of output is being produced.

4. Southern dairying needs improvement all along the line. The cost of production is unreasonably high, the sanitary conditions are often bad, and the price of first-class products is in some cases too low.

5. The three main points that every southern dairyman should bear in mind, and which can not be too strongly emphasized, are—

Better cows.

More home-grown feed.

A better product.

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THE CARE AND TESTING OF CAMEMBERT CHEESE.

By CHARLES THOM, Ph. D.,
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This article is intended to aid in establishing a more general understanding of the following points with reference to the Camembert type of cheese:

1. The proper appearance of ripe Camembert cheese.
2. The variations in flavor among really good cheeses, corresponding to the widely different tastes of consumers.
3. How to test a cheese to determine its degree of ripeness without cutting it.
4. How cheeses not fully ripe should be handled by dealer and consumer to get the best results.

THE CHEESE DESCRIBED.

Camembert cheeses are made in sizes $2\frac{1}{2}$ to $4\frac{1}{2}$ inches in diameter and $1\frac{1}{4}$ to $1\frac{1}{2}$ inches in thickness. They are ripened by the agency of molds and bacteria which form a feltlike rind over their whole surface one-sixteenth to one-eighth of an inch in thickness. This rind may be dry and gray or grayish-green, consisting of a feltlike surface of mold on the outside, below which a harder portion consists of mold embedded in partially dried cheese, or the moldy part may be more or less completely overgrown or displaced by yellowish to reddish slime composed mainly of bacteria. Good cheeses may have either appearance.

Inside the rind the cheese is softened progressively toward the center from all sides, so that a fully ripe cheese has no hard, sour curd in the center, but is completely softened. No mold should be visible inside the rind, but the moldy rind itself is necessary because the ripening is caused by the ferments secreted by the mold into the cheese. As the curd ripens the changed portion assumes a slightly deeper color than the unripe curd as a result of chemical changes. Well-ripened cheeses vary from nearly a fluid texture to the consistency of moderately soft butter.

DIFFERENTLY FLAVORED CHEESES.

Different brands of Camembert vary greatly in flavor when at their best. These differences have led to widely divergent ideals or tastes among consumers, and as a result to some contention as to which is

real Camembert. Investigation shows that slight differences in handling will cause large differences in texture and flavor in the same lot of cheese, hence all are equally entitled to be called Camembert. It is also possible to group together distinguishing marks which will enable the purchaser to select by examination such cheeses as will satisfy his particular taste. In general, intensity of flavor increases with the softness of the cheese; consequently very soft cheeses are usually strong cheeses. The firmer ripening is commonly associated with the milder and more delicate flavors. In surface appearance a sticky, slimy, yellowish rind betrays a tendency to strong flavors, while the dryer surfaces are generally a fair index to milder flavor. Although these signs sometimes fail in examining rapidly ripened domestic cheese, attention to them will give a large average of satisfaction.

HOW TO TEST RIPENESS.

The common practice of removing the box cover and pushing the index finger into the exposed surface of the cheese is not the best way for even an experienced judge to select a good cheese. The appearance of the cheese and its feeling to the finger may be sufficient after long practice, but the careful purchaser will find it far better to turn the box over, tap it gently so that the cheese will fall upon the free hand, then placing the thumb upon one side and the fingers upon the other, test by gentle pressure and a very slight shearing motion (one hand moved slightly toward or away from the body while the other is held stationary). Very little experience will enable one to detect whether a mass of unripe curd remains in the center, how large this is, if any, and the degree of softness in the fully ripe portion as indicated by firmness or tendency to lose shape in the hands. If a strong ammoniacal odor is present it indicates overripeness.

Unless the condition of the cheese is guaranteed by a reliable salesman the purchaser should examine each cheese carefully before buying. The consumer who wants a cheese exactly right will be amply repaid for the extra trouble.

CARE OF CAMEMBERT CHEESE.

Camembert cheeses are packed and shipped from the factory when half ripe or even earlier. This is especially true of imported cheese. In any case, after the cheese is packed for shipment transfer should be prompt. Crates should not be exposed to heat, dampness, or dryness. If the weather is warm, refrigeration in transit becomes necessary. If cheese must be stored in the warm season, refrigeration is indispensable.

As the imported cheese reaches our markets its ripening may often be finished by six to twenty-four hours in a warm room. Crates of

such cheese should not therefore stand in rooms as warm as 60° F. It has been a common but very bad practice to empty whole crates of cheese without reference to condition or ripeness upon the counter for the purchasers to pick from until all are sold. The purchaser of course takes his own risk, and usually gets a poor cheese. Such handling greatly hinders the trade in soft cheese.

To put trade upon a proper basis the condition of the cheese should be determined as soon as it is received. If already ripe, or nearly so, the whole lot belongs in the ice box. If still solid, the main stock should be kept in a cool cellar, 55° or below, and enough cheeses kept ripening in a warmer room to supply the trade from day to day. If the dealers would give the cheese the necessary care, based upon knowledge of its exact condition, as is the practice in the best hotels and restaurants, the percentage of satisfaction would be greatly increased. A cheese should not be offered for sale until it is fit to eat, and once sold it should be promptly served while in the best condition. Both dealer and consumer need therefore to base their treatment of Camembert cheese upon the same thoughtful care already given to other very perishable products.

The practice of the hotels and restaurants which serve this cheese regularly in perfect condition is comparatively simple. The cheeses are bought in quantity, and the condition of each consignment is promptly ascertained. The stock is stored, according to its condition—in the cellar or the ice box. A cheese nearly ripe is brought out and merely warmed for a few hours. If harder, the time in the warm room and even the temperature of the room is correspondingly increased, with careful watching. By keeping in this way enough cheeses just right to provide for the regular or expected trade, both dissatisfaction and losses are reduced to a minimum. One hotel serving cheeses in quarters at 25 cents a portion reports losses of less than 10 per cent on cheeses bought by the crate. This is much less than can be hoped for under less careful management, and such methods merit the consideration of all who deal in any way with Camembert cheese.

CANNED CAMEMBERT.

Among the forms in which Camembert cheese reaches the market are several brands of canned cheese. These have been partly or completely sterilized by heat, and the tins so far as examined have proved to contain fairly good flavored cheese. This treatment alters the flavor to some degree, but when successful preserves the cheese against time and changes of climate, making it available at any place or time of year. These brands command a limited but continuous market among those who can afford the increased price and who do not object to the flavor of cooking.

LABELS.

Domestic Camembert is now required to bear the legend "Camembert type" or "Camembert style," and to have designated upon it the State in which it is made. Only imported cheese is labeled Camembert without such modifying term.

Practically all Camembert cheese is made from milk from which a very little of the fat is taken. Labels reading "cream" or "double" or "triple" cream mean nothing beyond good cheese. Each brand and almost each cheese needs to be judged separately.

CAUTIONS.

Keeping.—If a cheese is already fully ripe, it should not be kept several days before eating. If it can not be eaten promptly, however, its tendency to quick decay can be checked (not entirely stopped) by putting it on ice and holding it there until nearly time to serve. Flavor and texture are then restored by permitting the cheese to thaw out at room temperature before serving.

Smell.—The proper odor of Camembert cheese is easily distinguished from the odors of decay, which are distinctly different. This odor may not be agreeable, but when properly discriminated from really objectionable odors it is no more disagreeable than that of fish or onions. If the cheese is really bad the odor becomes distinctly putrefactive.

Dried-up cheese.—A Camembert cheese shrunken from the side of the box or much depressed in the center is probably overripe or dried up by careless handling. A dried-up, powdery appearance of the rind with brownish or blackish areas indicates overripeness.

Bad ripening.—A yellowish to reddish, slimy surface, irregularly ridged and wrinkled, often conceals about one-fourth of an inch of liquefied, strong-flavored cheese over a hard, sour center, which refuses to ripen. This must not be confused with the smoother, reddish, slimy surface with faint parallel ridges, found upon certain excellent brands of cheese. Reddish, slimy cheeses should be carefully examined before buying.

Tin foil or paper wrapping.—Cheeses wrapped in tin foil incline to become soft and strong flavored; those wrapped in paper incline to the firmer textures and milder flavors. Cheeses wrapped in paper dry out so quickly when exposed that they must be watched more carefully than the others. They often become hard and gummy when old, hence are very deceptive.

Overripeness.—In addition to the marks already noted, overripe cheese always has a peculiarly sharp flavor readily recognized after eating once. Such a cheese showing no sour curd in the center is

often gummy or tallowy in texture and shows at times watery lines of cleavage between gummy masses.

Bargain Camembert.—Bargain-counter Camembert should be avoided unless the buyer is sure of his judgment as to the condition of the cheese. Cheeses sold at much reduction are almost sure to be either already unsalable at regular prices or so nearly so as to be very questionable. Some, however, enjoy cheese in various stages of over-ripeness, and such persons may safely buy the marked-down cheeses.

It should be remembered that there are few cheeses so good as good Camembert and few so bad as bad Camembert.

THE DEVELOPMENT OF THE EXPORT TRADE IN PUREBRED LIVE STOCK.[a]

By GEORGE M. ROMMEL,
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The exportation from the United States of meat-bearing animals and horses for city business, farm purposes, and pleasure has for many years been an important factor in our foreign trade. The accepted value of such animals in the world's markets, together with the rapid improvement of breeding animals in the United States, and the belief of many in the wisdom of providing an opening for the disposal of surplus American breeding stock has led to efforts on the part of individual breeders, breeders' associations, and the Federal Government to study the possibilities of developing a trade in breeding stock with foreign lands. In the palmy days of the American Merino sheep the demand from Australia and other countries was a very large factor in the trade, and even now the purchaser of rams of the various Merino types must meet the competition of foreign buyers. Whether this trade can be built up again on a considerable scale and whether it can be developed for all classes of American live stock is a question in which there is a growing interest.

PRESENT EXTENT OF THE TRADE.

At the present time the export trade in breeding animals is very small. Just how many animals are sent abroad annually for breeding is not known, because customs officers are not required to report such export movements, and breeders' associations almost without exception do not keep such records. We can gain a fairly definite idea, however, from the figures for the exports of animals to countries in South America, Africa, Asia, and Oceania, as it is known that with the possible exception of countries to the north of South America—as Canada, Mexico, the Central American States, and Cuba—exports of animals to these sections of the world for other purposes than breeding are insignificant. Considerable numbers of breeding animals go each year to the countries just named, but very much larger numbers are sold to them for other purposes. The fol-

[a] This paper was presented at a meeting of the Missouri State Board of Agriculture at Columbia, Mo., January 7, 1908.

lowing table is, therefore, made up from the reports of Trade and Navigation of the Department of Commerce and Labor, showing for the ten fiscal years from 1897 to 1906 the total exports of cattle, hogs, horses, and sheep to the countries above mentioned. With the exceptions noted in the footnotes to the table, it may be assumed that these figures show approximately our foreign trade in purebred live stock. A detailed table showing total exports of live stock to all countries for the period named appears in another part of this volume (p. 386).

Exports of cattle, hogs, horses, and sheep from the United States to South America, Asia, Oceania, and Africa, years ended June 30, 1897–1906.

Year.	Cattle.		Hogs.		Horses.		Sheep.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
1897	202	$11,918	2,623	$13,597	536	$61,245	1,515	$39,026
1898	324	10,182	3,660	19,701	488	58,210	1,751	39,799
1899	538	29,861	6,181	34,363	939	96,555	1,499	29,426
1900	86	5,405	2,739	18,652	[a] 13,300	1,281,694	1,208	20,703
1901	972	70,816	23	633	[a] 42,920	3,935,440	1,092	17,166
1902	926	39,873	33	885	[a] 60,562	6,147,955	1,115	26,311
1903	[b] 8,161	209,717	242	2,169	310	68,640	1,171	21,226
1904	[b] 5,572	193,646	40	1,334	126	29,132	992	30,743
1905	1,045	81,852	39	1,536	219	35,763	4,653	22,067
1906	1,862	153,849	81	3,555	66	40,360	760	18,402

[a] The exports of horses for the years 1900 to 1902, inclusive, were greatly enlarged on account of the purchases of the British army for use in South Africa. Exports to British South Africa for these three years are given as follows:

Year.	Number.	Value.
1900	8,199	$797,372
1901	37,465	3,468,455
1902	60,469	6,106,810

[b] The exports of cattle for the years 1903 and 1904 were swelled by exports to British South Africa of 7,029 head and 4,983 head, respectively. These were probably cattle taken to that country to restock after the Anglo-Boer war, and, while intended for breeding purposes, were not purebred, as may be seen by noting the values for the years mentioned.

Comparing the figures in the foregoing table with those for all animal exports, it is apparent that of the live animals going abroad the vast majority are destined for slaughter soon after landing or accompany emigrants. Nearly all European countries prohibit the importation of ruminant animals and hogs except for immediate slaughter, and the only animals which go to those countries under other conditions are horses and perhaps a few pets and poultry. Of the horses, nearly all are used for pleasure or business and few for breeding; however, a sufficient number of American trotters have gone to Europe to give the breed an excellent reputation. Of the large numbers of horses which go to British North America each year, few are pedigreed stock to be used for breeding; most of them accompany American farmers who are emigrating to the Canadian Northwest.

COUNTRIES OFFERING BEST OPPORTUNITIES.

The countries of the world whose markets appear to offer the greatest opportunities for the development of an American export trade in breeding stock are those of Europe for trotting horses; Canada for trotting and draft horses; Mexico, Central America, the West Indies, and South America for cattle, hogs, horses, and sheep; China and Japan for horses, cattle, and hogs; and South Africa and Australia for sheep. From the standpoint of location the parts of the world to which American breeders should logically look for the disposition of their surplus are the countries of the Western Hemisphere, south of the United States. In those countries there is a growing demand for improved blood, and stockmen are ready to spend money freely for animals of the right sort to improve their stock. In considering the subject, therefore, we can afford to devote our time almost exclusively to conditions and possibilities as they obtain there.

OBSTACLES IN THE WAY OF FOREIGN TRADE.

INADEQUATE MEANS OF COMMUNICATION.

The greatest drawback to the development of trade with countries south of us, especially those in South America, is the absence of good means of communication. There are few steamship lines running direct from New York or other ports of the United States to the great South American ports like Rio de Janeiro and Buenos Aires; one might almost say there are no good ones. It is said that if a person wishes to get to either of those cities in the shortest possible time it is best to go first to England by a fast trans-Atlantic boat and transship there to South America. Naturally the same is true of fast mail transportation. It is also said that in eastern South America banks sell exchange to the United States not direct on New York but via London. Therefore, if a South American buyer, when dealing with the United States, must have his animals shipped on slow boats with inferior accommodations, and must pay for them by exchange on London, it is more than probable that he will discriminate against American animals as long as such conditions exist. At best, crossing the equator is a trying ordeal for live stock and one which should be made as short as possible. Likewise it is more convenient to buy exchange direct than in a roundabout way. Trade conditions are, therefore, decidedly against the American breeder.

This state of affairs is one which has received a great deal of attention lately, as it is the principal drawback to United States trade of every kind with South American countries. Theoretically and sentimentally, the countries of South America should be good customers of

ours; actually, they are not by any means. It is doubtful, however, whether our relations with those countries were ever so close as they are to-day, and it is quite likely that the near future will see an improvement in business relations with that part of the world. When fast steamer routes are opened stockmen will have at their command more rapid and better means of shipment and one very serious obstacle to this trade will then be removed. With the increase of business of all kinds with South America more convenient methods of exchanging money and credit will naturally follow.

DISEASE IN FOREIGN COUNTRIES.

The presence of disease in foreign countries is a second obstacle to the development of an export trade. Healthy but nonimmune American animals coming into contact with infected ones after landing are liable to sicken and die, and no matter what the cause, the American animal will get the reputation of being unable to stand the climate. This is particularly to be guarded against in the export of cattle to countries in which Texas fever exists. This disease is perhaps the one most to be feared by the exporter, but fortunately our knowledge of it is now such that it is possible so to handle shipments that the danger of loss is reduced to a minimum. No cattle should be shipped to the West Indies, Mexico, Central America, South America, Australia, Africa, or other countries bordering on the Tropics, except to those sections which are known to be free from Texas fever, without having been first rendered immune by some form of inoculation. Texas fever is also found in southern France, Italy, Turkey, along the Danube River, in Roumania, Ireland, Finland, southern Russia, China, and Japan.[a] Immunity may be brought about either by direct blood inoculation or by inoculation of young animals by the infected cattle tick itself. For more complete safety, shipments from herds south of the Texas-fever quarantine line would probably be most satisfactory.

It should also be borne in mind that many other diseases even more dangerous than Texas fever exist in some foreign countries, and losses are likely to follow American exportations. The prevalence of disease in these countries can readily be ascertained by the prospective American exporter by reference to the annual reports of the Bureau of Animal Industry. (See pages 410–417 of the present volume.) Where diseases such as surra are prevalent no cattle or horses should be sent except with an understanding with the buyer that the animals, although healthy when exported, are at the buyer's risk after landing. No horseman, for example, should be so unwise as to guarantee that his horses will live in South Africa, a country where diseases pecu-

[a] See Bulletin 78, Bureau of Animal Industry.

liar to the horse are especially common and virulent. The ability of animals to " stand the climate " is more frequently a matter of resistance to diseases, and we should not expose our stock to fatal contagion at the risk of ruining what may be a very profitable export trade.

FRAUDS IN PEDIGREES.

Complaints have sometimes reached the Bureau of Animal Industry that some unscrupulous speculators have foisted inferior animals on foreign buyers, especially in Mexico. It is stated that grade dairy cattle have been taken to that country and sold as purebred, registry certificates being furnished which were manufactured and printed by the dealer who was not in any way connected with a reputable pedigree record association certified by the Secretary of Agriculture. This can be easily remedied by prohibiting the export of animals for breeding purposes unless they are accompanied with certificates of the secretary of an association which has the certification of the Secretary of Agriculture, and these certificates in turn certified as genuine by an official of the United States Government, preferably the Secretary of Agriculture. Foreign buyers would soon learn that a certificate to be genuine should bear the stamp of approval of the Agricultural Department, and that the purchase of an animal not accompanied by such a certificate would be at the buyer's risk.

HOW THE EXPORT TRADE MAY BE BUILT UP.

Granted that the preliminaries to a thriving export trade are provided—good steamship lines, good bank exchange, and the like—it then remains to show the foreign buyer what we have from the standpoint of individuality and to prove to his satisfaction the worth of American breeding stock. To this end a thorough campaign of education and exploitation is necessary. Through American consuls literature can be distributed setting forth the merits of our animals. By advertising and by correspondence, using foreign newspapers as freely as possible, the same end can be accomplished. One attempt should not be regarded as sufficient, but breeders should hammer away at the same point until an opening is effected.

It might pay breeders' associations to club together, as it were, and employ a good wide-awake man as a commercial agent, to be stationed, say, at Rio de Janeiro or Buenos Aires, to solicit trade, handle importations, manage sales, and attend to the thousand and one details which would come up in connection with such a position. On account of his familiarity with local conditions such a man could be of the greatest assistance to the American exporter and could save him many a troublesome experience. By pooling expenses the burden of his support would be only nominal to any one association entering

into the arrangement. One of the strongest features of this plan of selling would be its semiofficial character. Working under the auspices of reputable breeders' associations certified by the United States Secretary of Agriculture, selling animals whose pedigrees were also certified by the Secretary of Agriculture, the American seller could give his customers every assurance that they would get good value and honest dealing.

Experimental shipments of first-class animals, such as have already been made by several Americans, are of the greatest value in showing stockmen in other countries what kind of live stock the United States can produce. Sent to a foreign country under competent care, and landed in good condition, they will be almost certain to create a good impression and stimulate trade.

A further means of education can be obtained by an effort to bring the representatives of foreign countries in the United States into touch with our live-stock interests. Once or twice this has been tried, with rather indifferent success. If we could get foreign diplomats and consuls to attend our great live-stock shows occasionally, so that they could see for themselves, we could more easily build up a foreign trade. Governments send their representatives abroad not alone on matters of statesmanship but on business affairs as well. Doubtless many a clever American invention has found a ready sale abroad for the reason that a representative of a foreign government in the United States saw it in successful operation and interested his countrymen in it. The same could be done in the case of American breeding stock. The tremendous energy and remarkable progressiveness of the Japanese in this respect are cases in point, and what may be expected from such a source by the American stock breeder is indicated by the rather large purchases of horses and dairy cattle made by Japan during recent years. That country is also awakening to the value of the dairy industry, and when once started her demand for dairy breeding stock is more likely to seek its supply in the United States than elsewhere. Still another fact which illustrates this point is that the attendance of young men from Mexico and South America at our agricultural colleges, especially those institutions which pay much attention to animal husbandry, is stimulating in their home countries a demand for purebred live stock which will certainly enlarge the market at the command of the American breeder.

A GOVERNMENT BREEDING FARM.

The apparent difficulty of getting foreign representatives to attend our stock shows has been alluded to, and this leads the writer to suggest that the same end might be accomplished if the Government itself maintained a breeding farm, where representative animals of the

leading breeds could be kept. Such a farm, properly equipped, suitably maintained, and located near Washington, would be one of the points of interest of the national capital. Foreigners stationed at Washington could see, at a minimum of time and trouble, what the United States can produce in live stock, and by prohibiting the sale for export of animals from this farm the Government could safeguard and encourage the interests of American breeders. It would not be official representatives alone whose interest could be excited by such a farm; in addition, others who come to the United States on their own business or pleasure would, if interested in live stock, be very sure to make such an establishment one of their points to visit. When we think that nearly all visitors to the United States from abroad visit Washington, the advertising possibilities of a national breeding farm can be appreciated.

THE IMPORTANCE OF AMERICAN TYPES AND BLOOD LINES.

A suggestion of the highest importance was recently made, namely, that our breeders can not hope to develop an export trade of any magnitude until they advertise their animals as American, and the stockman who made this suggestion pointed out that until we are able honestly to claim for our own American-bred animals that they are for that reason better than animals bred in other countries we can not expect the foreign breeder to adopt such a view. So long as we advertise our Shorthorns as Scotch and claim that for this reason they are the best we can produce, the Shorthorn breeder in Argentina will go to Scotland for his bulls. So long as our Percheron breeders believe that the best they can use on their mares are imported stallions, the South American horseman will go to France for Percheron stallions. The standing of the American Trotter, the American Saddle Horse, the American Merino sheep, the American hog, and the American hen has been made permanent in the world's opinion because these breeds have stood on their own merits without fear or favor and without requiring an imported prop for support. It is highly gratifying to know that several of our breeds of cattle have been so improved since first imported that they are now actually more efficient and profitable under American conditions than they were in the countries of origin, and it is rare that the American breeder of such cattle finds an importation to his advantage. If these cattle are better adapted for the production of meat, milk, and butter in America than their foreign relatives, does it not hold true that they would be better for the same purpose in Argentina, Brazil, Uruguay, or other cattle-breeding countries? If this is true, why should it be difficult to prove the fact to the satisfaction of Argentine, Brazilian, Uruguayan, or other foreign breeders?

THE VALUE OF AN EXPORT TRADE DURING PERIODS OF LOW PRICES.

Lastly, the possibility of a foreign trade in breeding animals stands in direct ratio to the production of a surplus in the United States. Given a surplus, the trade will seek an outlet, either by way of the market, the abattoir, or by export for breeding purposes. It would be unfortunate indeed if a fall in prices for breeding animals should force the sale of our purebred cattle, sheep, and hogs for slaughter, or of our purebred horses for use on city streets. It is, therefore, timely that breeders' associations are interesting themselves in the development of the foreign trade. If a time of diminished values is now really upon us, the opening of a trade with other lands will save breeders from the disastrous sacrifices to which they were forced from 1893 to 1897.

THE POULTRY WORK OF THE BUREAU OF ANIMAL INDUSTRY.[a]

By ROB R. SLOCUM,
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In considering the poultry work of the Bureau of Animal Industry we naturally look back to the first work of this sort taken up by the Bureau. This consisted in answering letters of inquiry concerning the various phases of the poultry business. While the inquiries were, of course, not nearly so numerous as at present, they were important because of the widespread interest which they manifested in poultry and which led to the next step in the work of the Bureau—the publication and distribution of literature on poultry.

POULTRY PUBLICATIONS.

These publications, which were designed to present the fundamental principles of poultry keeping and to give information concerning the various breeds of poultry, are mainly of two classes—Farmers' Bulletins and bulletins of the Bureau of Animal Industry. The first bulletin treating solely of poultry was Farmers' Bulletin 41, "Fowls, Care and Feeding," which appeared in 1896. Since that time several other Farmers' Bulletins have been issued, while some of the older bulletins have been revised or superseded by later ones. Among the Farmers' Bulletins may be mentioned the following:

No. 51. Standard Varieties of Chickens. (Recently revised.)
No. 64. Ducks and Geese. (Also recently revised.)
No. 141. Poultry Raising on the Farm. (This, together with No. 41, has been superseded by No. 287.)
No. 177. Squab Raising.
No. 200. Turkeys.
No. 234. The Guinea Fowl and Its Use as Food. (Prepared by the Office of Experiment Stations.)
No. 236. Incubation and Incubators.
No. 287. Poultry Management.

The Farmers' Bulletins, except those which have been discontinued, are available for free distribution by the Department of Agriculture and by Senators, Representatives, and Delegates in Congress.

[a] This paper is based on an address presented before the American Poultry Association at Niagara Falls, N. Y., August 11, 1907.

The second class of publications (bulletins of the Bureau of Animal Industry) dealing with poultry have been less numerous. These are more technical in character and are not available for free distribution, but may be purchased of the Superintendent of Documents, Government Printing Office, Washington, D. C., at small prices. The following are among the bulletins of this class:

No. 29. The Plymouth Rock. (Price 15 cents.)
No. 31. The Wyandotte. (Price 15 cents.)
No. 90. Poultry Investigations at the Maine Agricultural Experiment Station. (Price 15 cents.)

In addition to the above-enumerated publications a considerable amount of information has been disseminated through articles on poultry subjects appearing in the Yearbooks of the Department of Agriculture and the Annual Reports of the Bureau of Animal Industry. Helpful information in short, concise form has also been issued in the form of Bureau circulars. Short reviews of the work done at the State experiment stations have also been issued in the Farmers' Bulletin series by the Office of Experiment Stations of the Department of Agriculture.

GREAT DEMAND FOR POULTRY LITERATURE.

The magnitude of the work of distributing poultry literature by the Department may be seen from the following report for the year 1906–7. This also serves as a good index of the number of persons interested in poultry as compared with the other branches of live stock. According to the report of the Editor of the Department of Agriculture there was distributed during the fiscal year ended June 30, 1907, a total of 5,817,425 Farmers' Bulletins. Of these 431,878, or 7.4 per cent, were bulletins dealing exclusively with poultry subjects. During the same period only 183,585, or 3.1 per cent, dealt exclusively with hogs. Sheep and goats together reached a total of 62,178, or 1.1 per cent. Horses are credited with 90,229, or 1.5 per cent. Beef and dairy cattle taken together reached a total of 207,059 or 3.5 per cent. Those dealing with dairy products and processes totaled 244,376, or 4.2 per cent. From this it will be seen that the distribution of poultry bulletins exceeds by nearly 200,000 any other of these groups.

The number of copies of Bureau of Animal Industry publications dealing with poultry distributed during the same time was 8,314. Many other bulletins, in which only a portion of the space was given to poultry but which were sent out because of the poultry information which they contained, have not been included in these figures.

INVESTIGATIONS CONCERNING THE POULTRY INDUSTRY.

Since its organization the Pathological Division of this Bureau has devoted considerable attention to the diseases of poultry, the results of the investigations being embodied in several Bureau bulletins. The Pathological Division has also assisted poultrymen by giving instructions regarding the suppression of epidemics of disease, and in severe cases has even sent experts to the scene of the trouble. Experiments to determine the digestibility of corn, oats, wheat, and meat by poultry have also been carried on by the Biochemic Division of the Bureau.

COOPERATIVE WORK WITH STATE EXPERIMENT STATIONS.

Another branch of work which the Bureau has taken up within recent years and which differs materially from any poultry work previously done is the breeding of poultry in cooperation with State experiment stations. This had its beginning in August, 1904, when the Bureau entered into cooperation with the Maine Agricultural Experiment Station to assist in continuing the poultry work already under way at that station. The station began this work nine years ago by the selection of the better laying hens as shown by their trap-nest records and mating these with sons of heavy layers. This work has been continued with each succeeding generation since that time. During the season of 1907, 1,000 hens were kept for testing and breeding, as well as a sufficient number of males with which to breed them, and 2,000 chicks were raised to furnish layers for testing during the next year.

Since the Bureau has been associated with the Maine station two entirely new lines of investigation have been taken up. The first is a study of the yield and welfare of hens kept for egg production when carried in medium-sized and large flocks under similar conditions. Four flocks of 50 hens each are being compared with two flocks of 100 hens each. The floor allotment in every case is 4.8 square feet per bird.

The other comparison is concerning the yields and health of laying hens kept in large and very large flocks in pens of the same size. For this experiment four identical pens, having a floor surface of 480 square feet each, are being used. In each of two of these pens 100 hens are housed, thereby giving each fowl 4.8 square feet of floor space. In each of the other two pens 150 hens are housed with a floor space of 3.2 square feet per fowl.

Cooperative work between the Pathological Division of the Bureau and the Rhode Island Experiment Station has also been carried on for the purpose of studying and attempting to find means of control-

ling the disease of turkeys known as blackhead which has caused such serious losses to turkey raisers. The preliminary results obtained at this station have been published as Circular 119 of the Bureau.

INVESTIGATIONS CONCERNING WHITE DIARRHEA OF CHICKS.

Bacteriological investigations recently made by the Pathological Division in connection with the study of blackhead of turkeys have resulted in demonstrating the presence in the intestines of all turkeys so affected of large numbers of a protozoan organism, *Coccidium tenellum*, which is the causative agent of white diarrhea of chicks and coccidiosis of poultry. This discovery throws new light on these diseases, and further studies are being made especially with a view to affording relief from the heavy losses caused by white diarrhea of chicks.[a]

EXPERIMENTS IN POULTRY HUSBANDRY.

Experimental work in poultry husbandry within the Bureau itself has been inaugurated recently. The first investigation was a comparison of the moist and dry mash and the hopper systems of feeding. This was begun in 1906 at the animal quarantine station of the Bureau at Halethorp, Md. From the standpoint of suitability for poultry raising this location was far from ideal. The land was low and poorly drained, and the amount of land available was small. However, it was decided that the work could be carried on there in a fairly suitable manner and would furnish a nucleus for more extended work should the opportunity arise.

A house 12 by 36 feet was constructed, containing three pens each 12 feet square, with suitable yards. Later a few smaller buildings and a house to be used for incubators were constructed. The equipment was necessarily modest, as the available funds were not large. The laying house was completed about October 1, 1906, but owing to unavoidable delay in obtaining stock the experiment was not begun until December 1.

Three lots of White Plymouth Rock pullets, 25 in each lot, were used. The fowls in pen 1 received a mixture of whole and cracked grains morning and evening scattered in the litter, and at noon a moistened mash. Pen 2 was fed in precisely the same manner with the exception that the mash was fed dry. The feed mixtures used for pen 3 were exactly the same as those given the other pens, but both grain and mash mixtures were fed from hoppers. The grain hopper was open until noon, when it was shut and the mash hopper opened. This in turn was closed at the night feeding time and the

[a] A preliminary report of these investigations has since been issued as Circular 128 of the Bureau of Animal Industry.

grain hopper reopened. Meat scrap was fed separately and freely to all the pens.

Early in the spring of 1907 males were purchased and placed with the hens. Eggs from the various pens were hatched and a record of fertility, hatching, etc., carefully kept to discover any influence which the method of feeding may have had. The chicks hatched have been carefully marked, and it is the intention to repeat this experiment with several successive generations to note the effect upon the vitality and vigor of the stock.

Twenty-five of the surplus cockerels have been caponized and are being fed in comparison with twenty-five cockerels. The other surplus cockerels have been divided into two lots, which are fed exactly the same ration, except that the linseed meal used in the mash fed to one lot has been replaced by cotton-seed meal in the mash fed to the other lot. This is being done to determine whether cotton-seed meal in moderate quantities may be fed to chickens with safety.

The experimental work was transferred from Halethorp to the Experiment Station of the Bureau at Bethesda, Md., 7 miles from Washington, about September 1, 1907, which makes it possible to continue the work under decidedly more favorable circumstances. The site here is much better than the old one, and more land (about 5 acres in all) is available. A good range supplied with shade is provided for the young stock. A laying house 16 by 80 feet with feed house attached has been constructed. The house is divided into five pens 16 feet square and is so situated that more pens can be added as needed. The house is of the open-front type and largely resembles the houses at the Maine Experiment Station. Five colony houses were also built to meet present needs. A small office building is in process of construction, and a suitable incubator cellar is to be built.

PRODUCTION AND MARKETING OF POULTRY AND EGGS.

Another line of work which is not strictly experimental, consisting of a field investigation of the production and marketing of poultry and eggs in the Middle West, has recently been taken up, an assistant having been appointed to devote his entire time to the study of this problem. It is a well-known fact that the methods of production and marketing often result in considerable deterioration and consequent loss to the producer. It is thought that this investigation will serve to point out the causes of such losses and to suggest methods of avoiding them.

SUGGESTIONS AS TO FUTURE POULTRY WORK BY THE BUREAU.

In considering the future poultry work of the Bureau it is well to compare the magnitude of the industry with that of the other live-

stock industries, so that its relative importance may be well understood. According to the figures for the Twelfth Census (the latest available) the total value of the animal products of the farm in 1899 in continental United States was $1,718,365,561. Of this total, the value of poultry raised and eggs produced reached $281,070,693, or 16.3 per cent. Only two groups of animal products exceeded this in value. The first of these, dairy products (including milk, butter, and cheese), reached a value of $472,276,783. The other group, classified as animals sold, reached a value of $722,614,328. This last classification, however, includes all animals sold from the farm—cattle, sheep, hogs, horses, etc. Hence, it is doubtful if any one branch of the animal industry, except dairying, greatly exceeds poultry in value of produce sold from the farm. It is also reasonable to suppose that the figures for the production of poultry and eggs are further below the truth than is the case with other animal products, as a strict account of poultry products is less often kept, while the large amounts consumed by the farmer are often disregarded entirely. If this relation existed between poultry and other live-stock industries in 1899, there is every reason to believe that poultry has gained in importance since then, as the succeeding years have been among the most prosperous for poultrymen.

With the poultry interests of the country occupying such an important position, there certainly is a great need for experimental work for its benefit. Until recently little work with poultry had been done by State experiment stations, and only a few are doing anything at the present time. Compared with dairying and the feeding of beef cattle, sheep, and hogs, an almost insignificant amount of experimental work has as yet been done. Consequently a broad field is open for investigation.

NEED OF AN EXPERIMENTAL FARM.

For properly continuing and extending the poultry work of the Bureau suitable equipment is of course necessary. First of all, for most advantageous work the Bureau should own a live-stock farm, where all the experimental work in animal husbandry could be conducted. Naturally the larger animals would require much the greatest amount of land, but this farm should be of sufficient size so that at least 50 acres could be devoted to poultry. It should, moreover, be convenient to Washington. With a farm of this sort and suitable provision for its equipment, it would be possible to erect permanent buildings and make improvements of a permanent character.

The portion of such a farm devoted to poultry should be equipped with the most up-to-date and efficient houses and appliances, thereby rendering the experimental work more satisfactory and at the same time lessening the great amount of work always associated with such

an experimental plant. Complete and up-to-date equipment would also be of great educational value to the large number of visitors always attracted to such a plant.

With a plant of this size it would easily be possible to keep 5,000 head of laying stock, which would furnish breeders and fowls for experimental purposes and at the same time would allow the keeping of representatives of all the leading varieties, thereby increasing the demonstrative value. It would not be necessary to confine the work to chickens, as there would be room to keep enough ducks, geese, turkeys, and pigeons to allow experimental work with them as well.

In short, the plant should be made as complete, practical, and up to date as possible. It is not possible, of course, to conduct an experimental plant wholly along lines suitable for a commercial establishment, but it would be the intention to use sound business methods in its management wherever such methods did not interfere with the experimental work. A suitable staff of expert poultrymen and laborers would of course be necessary to give the work proper attention and secure good results. Each year liberal funds would have to be provided to meet the running expenses of such a plant.

LINES OF EXPERIMENTAL WORK WHICH SHOULD BE TAKEN UP.

With the acquisition of suitable equipment, the experimental work of the Bureau should be conducted along the following lines:

1. Experimentation as to methods of feeding and management.
2. Experimental work in breeding.
3. Experimental work of especial value to fanciers.
4. Experimental work in incubation and brooding.
5. Digestion experiments.
6. Field investigations of various problems.

Experimentation as to methods of feeding and management is a broad subject and one which in many respects is largely affected by local conditions. For this reason it is and probably will continue to be the line given most attention by the State experiment stations. It is, however, a subject which can stand an almost infinite amount of investigation, and there are many problems falling under this head which are of general interest and which should be considered by the Bureau, especially in the case of investigations which are beyond the means of the State stations. As explained previously, the Bureau is already studying the dry and moist mash and the hopper systems of feeding. This investigation will be continued, its scope being increased as required and various new phases of importance being studied as they develop.

Another problem which could be studied to advantage is the relative gain made by chicks grown on dry feed, on moist mash, and with hoppers. The merits of these systems are usually argued on the

number of chicks raised by them, but the matter of growth should also be considered.

Experimental work in breeding has been largely neglected by poultry men other than fanciers. The selection for vigor, which has been practiced, has in the main been haphazard. A small amount of selection and breeding for increased egg production has been done, but often the vigor of the stock has been neglected. The breeding for increased egg production, as carried on by the Bureau in cooperation with the Maine station, is recognized as of great importance and will be continued.

The breeding of poultry for meat production to enhance quick growth and early maturity along lines similar to those used by breeders of larger meat-producing animals seems to present a most desirable line of investigation. Tremendous strides have been made in this respect during the last twenty-five years with beef cattle and hogs. The breeders of these animals have shortened by many months the time necessary to feed their stock to get them to a desired weight. This has benefited the producer by enabling the money tied up in the work of breeding and feeding the animals to be turned over more rapidly. If poultry men, raising strictly for the best broiler and roaster trade, can shorten the period of growing and finishing the fowls by two or three weeks, the cost of production could be very considerably lessened and the profits correspondingly increased. In this connection some of the celebrated foreign meat breeds could well be given a comparative test with our own breeds. As a final test of the quality and economy of production, careful slaughter tests to determine relative proportions of feathers, offal, edible flesh, and most desirable parts should be made.

Experimental work which would be of especial value to fanciers is a right which the fanciers of the country have earned by the activity which they have displayed in behalf of the poultry industry. As a class they have been the most active in combining and in demanding and obtaining recognition for the industry. A careful study could be made of the effects of various feeds upon the color of flesh, skin, plumage, etc., and the possibility of modifying color by this means.

Problems in incubation and brooding are of vital importance to the poultry industry. A great deal of work of this kind is being taken up by the State stations, but so important is this subject that it should be among the first work to receive attention at the hands of the Bureau.

Little has ever been done to determine the digestion coefficients of various feeding stuffs for poultry. The figures usually given have been taken from those of other animals, and are, consequently, only approximate. The anatomical difficulties in the way account for the small amount of this work which has been done. A careful, comprehensive investigation which would establish these coefficients would be of value.

REPORT OF A COMMISSION ON CERTAIN FEATURES OF THE FEDERAL MEAT-INSPECTION REGULATIONS.

LETTER OF SUBMITTAL.

WASHINGTON, D. C., *July 29, 1907.*

The honorable the SECRETARY OF AGRICULTURE,
Washington, D. C.

SIR: The commission appointed by you for the purpose of studying those portions of the present meat-inspection regulations "which refer to the disposition of carcasses affected with various diseases and abnormal conditions" and "to adopt resolutions concerning the subject of the fitness of meat for human food, which ideas we desire to incorporate so far as practicable in our regulations governing meat inspection," has the honor to submit herewith the following report.

WILLIAM H. WELCH, *Chairman,*
Professor of Pathology, Johns Hopkins University.
L. HEKTOEN,
Professor of Pathology, University of Chicago.
JOSEPH HUGHES,
President of Chicago Veterinary College.
V. A. MOORE,
Professor of Comparative Pathology, Cornell University.
LEONARD PEARSON,
Dean Veterinary Department, University of Pennsylvania.
M. J. ROSENAU,
Director Hygienic Laboratory,
United States Public Health and Marine-Hospital Service.
CH. WARDELL STILES, *Secretary,*
Chief Division of Zoology, Hygienic Laboratory,
United States Public Health and Marine-Hospital Service.

SUMMARY.

A commission of seven men was convened by the Secretary of Agriculture to express opinion upon "the disposition of carcasses affected with various diseases and abnormal conditions."

Pages 12–16, Regulation 15, of the Bureau of Animal Industry, Order No. 137,[a] were designated by the Chief of the Bureau of Animal Industry as being the part of the regulations upon which opinion was desired.

The commission held sessions at Washington on February 4, 5, and 6, 1907, and reports that in general the regulation in question fully

[a] This order appears in the Twenty-third Annual Report of the Bureau of Animal Industry, p. 362.

safeguards the public health in so far as the points contained in Regulation 15 are concerned. If there be any general error in the regulation, this is in favor of the public rather than in favor of the butchers and packers. Most of the paragraphs of Regulation 15 are indorsed without comment. Several sections (for instance, the sections on hog cholera, swine plague, actinomycosis, tuberculosis, and tapeworm cysts) could be made less stringent without any danger to the health of the consumer.

HISTORY OF THE CONVENING OF THE COMMISSION.

Under date of December 21, 1906, the honorable the Secretary of Agriculture sent out letters to the seven persons whose names are mentioned in the communication which is here quoted:

DEAR SIR: It has been suggested from several sources that if those portions of our meat-inspection regulations which refer to the disposition of carcasses affected with various diseases and abnormal conditions could be made to conform with the opinion of a commission of experts not connected with this Department it would give to such regulations when adopted a support which is so manifest in the execution of the meat-inspection rules in European countries. I have therefore deemed it advisable to select such a commission to assemble in Washington about February 4 to adopt resolutions concerning the subject of the fitness of meat for human food, which ideas we desire to incorporate, so far as practicable, in our regulations governing meat inspection.

The following men will be requested to become members of this commission:

Dr. L. Hektoen, professor of pathology, University of Chicago.

Dr. Joseph Hughes, president of Chicago Veterinary College.

Dr. V. A. Moore, professor of comparative pathology, Cornell University.

Dr. Leonard Pearson, dean, veterinary department, University of Pennsylvania.

Dr. M. J. Rosenau, director of hygienic laboratory, United States Public Health and Marine-Hospital Service.

Dr. Ch. Wardell Stiles, chief, division of zoology, Hygienic Laboratory, United States Public Health and Marine-Hospital Service.

Dr. W. H. Welch, professor of pathology, Johns Hopkins Medical School.

If you will kindly signify your willingness to be a member of this commission and notify me if the date is convenient, I will appreciate it.

Respectfully,

JAMES WILSON, *Secretary.*

After letters of acceptance were received by the Secretary of Agriculture from all seven men mentioned in the foregoing, the following letter was received by the members of the commission:

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., January 8, 1907.

DEAR SIR: Your letter of the — ultimo, addressed to the Secretary of Agriculture, has been referred to this office.

In reply I am pleased to learn of your willingness to serve as a member of the commission appointed to consider those portions of the meat-inspection

regulations of this Department which pertain to the disposition of carcasses affected with various diseases and abnormal conditions.

The date suggested, February 4, seems to meet with general approval, and it has therefore been decided to have the members gather in my office in the Department of Agriculture at 11 a. m. on that date. Arrangements have been made to have the formal meetings of the commission take place in a committee room at the New Willard Hotel.

Under separate cover I have forwarded a copy of the rules and regulations, which contains on pages 12–16 the sections concerning which we desire your opinion; also the amendments and circular letters bearing on these regulations. If there is any further information you desire, I am at your service.

Very respectfully,

A. D. MELVIN, *Chief of Bureau.*

In accordance with Doctor Melvin's letter of January 8, 1907, the commission reported at his office at 11 a. m., Monday, February 4, when Doctor Melvin addressed them as follows:

REMARKS BY DOCTOR MELVIN AT THE PRELIMINARY MEETING OF THE COMMISSION.

GENTLEMEN: It is a very great pleasure to me to greet you and to have your assistance in dealing with one of the country's great problems, for the conservation of the health of a people is undoubtedly of the foremost importance. As meat enters so largely into the diet of the American people it would seem but reasonable for Congress to provide a law to regulate the interstate traffic in that article and to say that only meats which are clean, sound, wholesome, and fit for human food should enter into interstate and foreign commerce.

Since the passage of the present law extending to this Department ample authority to conduct inspection at establishments engaged in interstate or foreign traffic, to supervise the preparation of meat and meat-food products, and to regulate the sanitary conditions under which they are prepared, the fact has been clearly demonstrated that the law has not come any too soon. Our investigations have shown that in far too many establishments human food was prepared under the most revolting conditions, and it is only fair to say that there were establishments reasonably clean, and some even above reproach. But it costs money to keep these houses clean, and there is a strong tendency on the part of the many to do as little cleaning as possible on account of this same cost.

We have problems to solve regarding sanitary construction of abattoirs; the stage at which meat becomes unfit, such as rancid meat and fats; the wholesomeness of meats that have been canned for different lengths of time under certain methods of preparation; the wholesomeness of refrigerated meats, and what preservatives may be permitted to be used with safety. The Department has taken up all these questions and will again pass upon them as soon as results can be obtained.

The question upon which the Secretary and myself particularly desire the opinion of you gentlemen is the one as to the effect of disease upon meat with reference to the fitness of the meat for human food.

During the fiscal year 1906 the following condemnations were made:

Diseases and conditions for which condemnations were made, fiscal year 1906.

Cause of condemnation.	Cattle.		Sheep.		Calves.		Hogs.	
	Carcasses.	Parts.	Carcasses.	Parts.	Carcasses.	Parts.	Carcasses.	Parts.
Actinomycosis	797	1,985	.....	.....	2	1	13	5
Tuberculosis	13,548	1,114	4	.....	25	.....	95,396	113,491
Caseous lymphadenitis	.....	.....	680	3	.....	.....	1	.....
Hog cholera and swine plague	.....	.....	.....	.....	.....	.....	19,329	.....
Texas fever	328	.....	.....	.....	280	.....	.....	.....
Echinococcus	.....	.....	6	.....	.....	.....	1	15
Measles	.....	.....	.....	.....	.....	.....	13	.....
Scabies	.....	.....	2	.....	.....	.....	26	.....
Eczema	.....	.....	.....	.....	.....	.....	3	.....
Erysipelas	.....	.....	.....	.....	.....	.....	22	.....
Cancer	22	.....	4	.....	1	.....	11	.....
Tumors	9	3	7	.....	1	.....	624	275
Abscesses	94	242	108	22	24	2	1,256	419
Pneumonia	278	.....	335	.....	28	.....	1,333	.....
Pleurisy	25	.....	29	1	4	.....	97	1
Carditis	.....	.....	4	.....	1	.....	.....	.....
Enteritis	52	.....	123	.....	13	.....	318	.....
Peritonitis	299	.....	104	.....	48	.....	685	.....
Metritis	76	.....	15	.....	1	.....	229	.....
Nephritis	2	.....	11	.....	9	.....	37	.....
Uremia	8	.....	23	.....	3	.....	49	.....
Mammitis	.....	.....	2	.....	.....	.....	2	2
Septicemia	246	.....	198	.....	56	.....	1,196	.....
Pyemia	456	.....	201	.....	51	.....	3,033	.....
Gangrene	32	.....	10	.....	6	1	15	.....
Anemia, emaciation, marasmus	2,139	.....	2,303	.....	657	.....	798	.....
Ascites	10	.....	27	.....	1	.....	59	.....
Jaundice	9	.....	488	.....	18	.....	920	.....
Asphyxia	19	.....	46	.....	2	.....	.....	.....
Arthritis	.....	.....	1	.....	2	.....	.....	.....
Leukemia	.....	.....	2	.....	2	.....	.....	.....
Pulmonary apoplexy	.....	.....	9	.....	.....	.....	.....	.....
Cysticercus tenuicollis	.....	.....	1	.....	.....	.....	.....	.....
Melanosis	.....	.....	.....	.....	2	.....	.....	.....
Extreme temperature, various causes	.....	.....	144	.....	2	.....	939	.....
Pregnancy	81	.....	38	.....	.....	.....	316	.....
Recent parturition	122	.....	18	.....	.....	.....	51	.....
Hernia	1	.....	4	.....	.....	.....	65	.....
Downers, bruise, injured, etc	1,786	672	833	97	391	85	1,019	7,723
Dead from various causes	867	.....	2,873	.....	444	.....	13,222	.....
Too young	.....	.....	1	.....	3,224	.....	.....	.....
Killed by local inspectors	417	.....	164	.....	6,694	.....	10,537	.....
Total	21,723	4,016	8,821	123	11,992	89	151,615	121,931

The condemnation and destruction of such an amount of food means much to the owners, who are usually innocent purchasers and do not receive any remuneration therefor, and it should also mean much to those who might otherwise have consumed the same.

The principal disease, you will observe, is tuberculosis. From year to year do the condemnations from this disease increase, due to an increase both in the efficiency of the service and in the disease itself. I am informed that the losses of one of the largest firms alone amount to $600,000 a year, principally on account of this disease. What might have been the result had this meat been consumed we can only imagine.

An effort has been commenced looking to the location of the centers of infection, with the hope that some plan of eradicating the disease among live stock may present itself.

The Department is required by law to stand as the mediator between the slaughterers and the consumers, and its only thought is to do justice to both.

Realizing its great responsibility to both, it has sought your assistance and asks your advice in this most important work.

Whatever assistance the Department may be able to render during your conference it will readily give.

POWERS OF THE COMMISSION.

From the two letters and from Doctor Melvin's remarks quoted in the foregoing it will be noticed that there is more than one interpretation possible as to the points upon which this commission is called upon to report. The expression in the letter from the Secretary of Agriculture, "I have deemed it advisable to select such a commission * * * to adopt resolutions concerning the subject of the fitness of meat for human food," might be interpreted as giving the commission power to discuss any question relative to meat inspection. The portion of Doctor Melvin's letter referring to "pages 12–16" containing "the sections concerning which we desire your opinion" confines the recommendations of the commission to Regulation 15.

In this report the commission adopts the interpretation that its powers of recommendation are limited to Regulation 15. It therefore follows that nothing said in or omitted from this report is to be interpreted as a concurrence in or a disapproval of other points raised in other paragraphs of the regulations or in the law upon which the regulations are based.

In order to avoid ambiguity, the commission also emphasizes the fact that its recommendations as to the passing of or disposal of meats are based upon the "two-class system" of meats now in vogue in this country, and not upon the "three-class system" obtaining in certain other countries.

THE FORMAL MEETINGS OF THE COMMISSION.

Formal meetings of the commission were held as follows: The New Willard Hotel, Washington, D. C., February 4 (two sessions), February 5 (two sessions), February 6 (one session).

At the first formal meeting of the commission it was voted to request Dr. John R. Mohler, Chief of the Division of Pathology, United States Bureau of Animal Industry, to attend the meetings of the commission. He was informed to this effect and was in regular attendance. He brought with him a stenographer and a messenger detailed by Doctor Melvin for service in connection with the work of the commission. The commission desires to express officially its appreciation of the services rendered to it by Doctor Mohler.

At the second session of the commission Dr. O. E. Dyson, of Chicago, made formal application for a hearing as a representative of the packing interests. After consideration this request was granted, with the distinct understanding on the part of the commission that

should any other interests desire hearings their applications would also be considered.

No other application for hearings has been received, but certain minor criticisms of the regulations contained in a letter from Mr. James B. Reynolds to Solicitor McCabe have been referred to the commission for consideration.

THE POPULAR CONCEPTION OF THE TERM "DISEASED."

The commission would invite attention to a very widespread popular misconception as to the significance of the word "diseased" in connection with meat inspection. To the popular mind the idea of eating "diseased" animals is abhorrent. From the standpoint of meat inspection, however, the term "diseased" must be used in a sense not entirely in harmony with the popular conception of this word.

The commission could easily undertake to show that not any single animal used for food in any part of the world would, upon microscopic study, be shown to be absolutely free from all infection or lesion, if said animal were presented to it for examination. Some persons might assert that in all of these infections and conditions the meat of the animals should be considered "diseased." Such interpretation is not, however, justified from a standpoint of meat inspection. A light sarcosporidiasis[a] in cattle, sheep, swine, or goats, for instance, would not justify the condemnation of a carcass, for there is no proof that such a condition depreciates, in even the remotest degree, the value of the meat or that this infection is transmissible to man. Likewise, there may be a strictly localized tuberculosis, consisting, for instance, of an isolated tuberculous nodule in the lungs, in the liver, or in some other portion of the body. Such nodule would make the particular point infected "diseased" from the standpoint of meat inspection; in the opinion of some members of the laity, such nodule would also make the entire meat of the animal "diseased" and call for the condemnation of the entire carcass; from the standpoint of meat inspection, the carcass in general would not be "diseased," and there would be no justification in condemning it.

The veterinary inspector, in judging whether a carcass is "diseased," must do so upon the general principles of pathology in its relation to the public health, and not upon any preconceived, exaggerated, or sentimental idea.

The commission would suggest that the cooperation of the public is most valuable in aiding in the suppression of frauds in the meat

[a] One of the most common infections of food animals, especially of hogs. It is due to the presence of a minute parasitic protozoon in the muscles.

trade, but that it would be well for the public to have confidence in the ability of the veterinary inspectors to pass judgment upon the purely technical side of the questions involved, since such judgment can be of value only when expressed by persons especially trained for this purpose.

Illustrative of the precautions taken by the Department of Agriculture to safeguard the public health, it is the opinion of the commission that the Bureau of Animal Industry, acting under the existing regulations, would necessarily condemn certain meats which would be allowed, either with or without restrictions, according to circumstances, upon the markets of Germany, France, England, and other countries.

THE CLASSIFICATION OF MEATS.

Attention may be called to the circumstance that the problems of meat inspection are in several respects different and in large measure simplified for those countries, such as Germany, where the so-called "Freibank" system prevails, as contrasted with our country, where meats are simply either passed or condemned. While it is doubtless true that certain meats which under our "two-class system" must be condemned could without the slightest injury to health and with no little economic advantage be admitted to the market under proper precautions as meats designated as "of inferior grades" (Freibank meat), the commission does not undertake to make any recommendations concerning the adoption of a similar "three-class system" under existing conditions in this country, involving as this question does many considerations other than purely sanitary ones. As such system is safe, from a public health point of view, it is suggested that the question be considered whether it is feasible in this country from the administrative and commercial points of view.

CIRCULARS OF MEAT INSPECTION.

The commission would respectfully suggest to the Department the advisability of the preparation and publication of one or more circulars or keys explanatory of the various paragraphs of the regulations. Such circulars would fulfill a double purpose. They would tend to make the condemnations more uniform, in that the inspector would more clearly understand the exact position of the Department in reference to the action taken on the diseases in question, and at the same time such circulars would be of great educational value in improving State and local inspection.

The commission understands, of course, that the inspectors, before entering the service, are expected to be grounded in the principles of meat inspection, but the fact remains that opinions differ upon certain points.

DISPOSAL OF DISEASED CARCASSES AND ORGANS UNDER REGULATION 15.

The commission approves of the provisions found in paragraphs *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h1*, *h3*, *h4*, *i1*, *j*, *l*, *m*, *n*, *q*, *r*, *s*, *u*, *v*, *w*, *x*, *y*, *z*, and *aa*.

The commission respectfully suggests the consideration of certain additions or changes to Regulation 15, shown in the following:

VACCINE ANIMALS.

The commission respectfully recommends the insertion of the following provision in Regulation 15 (*d*):

(1) *Vaccine animals.*—Carcasses of vaccine animals mentioned under Regulation 13, paragraph 4, shall be condemned.

A corollary to this addition would be an addition to Regulation 13, paragraph 4, line 2, after the word "disease" and before the word "are," to the following effect:

And vaccine animals with unhealed lesions accompanied by fever and which have not been exposed to any other infectious or contagious disease.

HOG CHOLERA AND SWINE PLAGUE.

The commission respectfully suggests that Regulation 15 (*h*) (2) be amended to read as follows:

(2) Provided they be well nourished, carcasses showing slight lesions of these diseases may be passed.

ACTINOMYCOSIS.

The commission respectfully recommends that Regulation 15 (*i*) be amended to read as follows:

(2) Carcasses of animals showing uncomplicated localized actinomycotic lesions other than or in addition to those specified in 15 (*i*) (1) may be passed after the infected organs and parts have been removed and condemned.

(3) Carcasses of animals showing a generalized actinomycosis shall be condemned.

MEAT FROM TUBERCULOUS ANIMALS.

It is evident that it is in connection with tuberculosis that the Department has the greatest difficulty in harmonizing contending views. This is natural, inasmuch as tuberculosis is the most common diseased condition with which the inspectors have to deal, and the popular prejudice against using meat from tuberculous animals is more widespread than is the prejudice against diseases with which the public is less familiar.

It can not be too strongly insisted that the slaughterhouse under inspection is the proper place for all live stock infected with tuberculosis, unless such animals are manifestly affected with advanced or generalized tuberculosis, in which case they should be sent for slaughter to a fertilizer establishment. The sooner these animals,

with the exception noted, are fed into such slaughterhouses, the sooner this disease will be eliminated from the dairy herds. At these slaughterhouses such animals should be inspected; the meat should then be judged on rational principles, rather than on sentimental ideas; such meat as can be safely used for food should be treated accordingly, and other cases should be treated in such a way that they can do no harm.

Persons who desire to see the public safeguarded against tuberculosis will do well to consider the subject from a rational point of view, rather than a sentimental one, which is calculated not only to support a policy which is irrational, scientifically unjustified, unduly expensive, and economically and practically of impossible general application, but which inherently has a tendency to inhibit dairy-herd owners from joining in a movement to eradicate the disease.

Turning now to the Department Regulation 15 (*k*) (1–9), pages 13–14 of Order 137, the commission would state that it endeavored to study this regulation with a view to indorsing or amending it, but found it advisable for its purposes to rewrite it. This advisability resulted from the following facts:

Upon reading the regulation, the first effect upon one's mind is that it is based upon an arbitrary combination of lesions. More careful study of the wording shows, however, that there is another possible explanation, namely, that it is the result of the most common combinations of lesions noticed in attempting to apply certain recognized principles in a practical or diagrammatic manner to conditions as found in the inspection. Inquiry develops the fact that this latter explanation is the correct one. From this point of view, however, it is necessary to have extensive statistical data at hand, and since considerable delay would result in obtaining the necessary data, it has been thought more feasible for the commission to consider general principles and general rules, rather than diagrammatic rules based upon statistics resulting from such principles.

In following this course the commission desires to state that its action in this respect is not to be interpreted as a reflection upon the present regulation or upon the plan adopted in framing it. There is, however, a feeling that the present regulation would be less likely to be misunderstood if the principles upon which it is based were published.

The commission adopts the following principles in connection with meat inspection for tuberculosis:

PRINCIPLES.

1. The fundamental thought is that meat should not be used for food if it contains tubercle bacilli, if there is reasonable possibility

that it may contain tubercle bacilli, or if it is impregnated with toxic substances of tuberculosis or associated septic infections.

2. On the other hand, if the lesions are localized, if there is no distribution of tubercle bacilli through the blood, or by other means, to the muscles, or to parts that may be eaten with the muscles, and if the animal is well nourished and in good condition, there is no proof or reason to suspect that the flesh is unwholesome.

3. *Generalized tuberculosis.*—Evidences of generalized tuberculosis are to be sought in such distribution and number of tuberculous lesions as can be explained only upon the supposition of the entrance of tubercle bacilli in considerable number into the systemic circulation. Significant of such generalization are the presence of numerous uniformly distributed tubercles throughout both lungs, also tubercles in the spleen, kidneys, bones, joints, and sexual glands, and the lymphatic glands connected with these organs and parts, or the splenic, the renal, the prescapular, the popliteal and inguinal glands, when several of these organs and parts are coincidently affected.

4. *Localized tuberculosis.*—By localized tuberculosis is understood tuberculosis limited to a single or several parts or organs of the body without evidence of recent invasion of numerous bacilli into the systemic circulation.

RULES FOR DISPOSITION OF MEATS.

Rule A.—The entire carcass shall be condemned—

1. When it was observed before the animal was killed that it was suffering with fever.

2. When there is a tuberculous or other cachexia, as shown by anemia and emaciation.

3. When the lesions of tuberculosis are generalized, as shown by their presence not only at the usual seats of primary infections, but also in parts of the carcass or the organs that may be reached by the bacilli of tuberculosis only when they are carried in the systemic circulation. Tuberculous lesions in any two of the following organs are to be accepted as evidence of generalization when they occur in addition to local tuberculous lesions in the digestive or respiratory tracts, including the lymphatic glands connected therewith: (*a*) Spleen, (*b*) kidney, (*c*) uterus, (*d*) udder, (*e*) ovary, (*f*) testicle, (*g*) adrenal gland, (*h*) brain or spinal cord or their membranes. Numerous uniformly distributed tubercles throughout both lungs afford evidence of generalization.

4. When the lesions of tuberculosis are found in the muscles or intermuscular tissue or bones or joints, or in the lymphatic glands which drain the muscles, bones, or joints.

5. When the lesions are extensive in one or both body cavities.

6. When the lesions are multiple, acute, and actively progressive. Evidence of active progress consists in signs of acute inflammation about the lesions, or liquefactive necrosis, or the presence of young tubercles.

Rule B.—An organ or a part of a carcass shall be condemned—

1. When it contains lesions of tuberculosis.

2. When the corresponding lymphatic glands are tuberculous.

3. When the lesion is immediately adjacent to the flesh, as in the case of tuberculosis of the parietal pleura or peritoneum, not only the membrane or part affected, but also the adjacent thoracic or abdominal wall, is to be condemned.

4. When it has been contaminated by tuberculous material, through contact with the floor, a soiled knife, or otherwise.

Rule C.—The carcass, if otherwise healthful and if none of the conditions described in Rule A are present, shall be passed, after the parts containing localized lesions are removed in accordance with Rule B.

Rule D.—Carcasses of animals affected with tuberculosis (except those mentioned under Rule A, 1 and 2) may be rendered into tallow or lard when the disease is not generalized and extensive and is of such distribution that all parts containing tuberculous lesions may be removed. Such carcasses shall be cooked by steam at a temperature not lower than 220° F. for not less than four hours.

Rule E.—All condemned carcasses, parts of carcasses, or organs showing lesions of tuberculosis shall be deposited in receptacles provided for that purpose, and shall either be tanked at once or be locked in the " condemned " room until such time as an employee of the Department can see that they are placed in the tank.

In reference to the cases of tuberculosis in swine which are said to show encapsulated tuberculous lesions in the sublumbar glands, but practically no other lesions, the opinion was expressed that these cases seem to be covered by the rules adopted, and that in case the sublumbar infection in question is to be interpreted as not necessarily implying transportation of the bacilli through the systemic circulation (as has been suggested), such carcasses could be classified under Rule B, and could be passed for consumption after removal of the infected part, or could be condemned for meat under Rule A and used for lard, according to the extent and condition of the lesions.

It may be here added that at the request of the commission Doctor Mohler compared the foregoing Rules A–E with the existing Bureau Regulation 15 (*k*, 1–9), and the points were brought out that all cases condemned under Rules A–E would also be condemned under Regulation 15 (*k*, 1–9), but that Rules A–E were somewhat more liberal in passing for food certain classes which under Regulation 15 (*k*, 6–7) would be rendered into tallow or lard. Doctor Mohler con-

sidered that any action based upon Regulation 15 (*k*, 1–5) would be identical with an action on the same cases if subjected to Rules A–E. The result of Rules A–E, therefore, would be a net gain in uncondemned meats.

TAPEWORM CYSTS.

The commission would respectfully suggest that Regulation 15 (*o*), relative to tapeworm cysts, be amended to read as follows:

(*o*) *Tapeworm cysts.*—(1) Carcasses of animals infected with more than 10 tapeworm cysts known as *Cysticercus bovis* and *C. cellulosæ* shall be condemned for meat, but such carcasses may be rendered into lard or tallow.

(2) Carcasses of cattle found infected with not more than 10 tapeworm cysts known as *Cysticercus bovis* may, after removal of the parasites, be canned, or they may be passed after such carcasses have been kept in cold storage for twenty-one days.

(3) Carcasses of swine found infected with not more than 10 tapeworm cysts known as *Cysticercus cellulosæ* may, after removal of the parasites, be passed, provided the meat is to be thoroughly cooked under Government supervision.

(4) Carcasses of animals found infected with gid bladder worms (*Cœnurus cerebralis* = *Multiceps socialis*) may be passed after condemnation of the infected organ (brain, spinal cord).

(5) Carcasses or parts of carcasses found infected with the hydatid cyst (Echinococcus) may be passed after condemnation of the infected part or organ.

Although note is taken of the fact that the Federal condemnations on account of tapeworm cysts are very few, the commission is led to suggest the foregoing for the following reasons:

(*a*) It is felt that State and local regulations will be based upon the Federal regulations, and while less specific regulations might not lead to protest or work serious hardship in Federal condemnations (because the proportion of cestode infections mentioned under Regulation 15 (*o*) might be very low), still if adopted in State and local regulations a single unnecessary condemnation in the trade of a local butcher, slaughtering only a few animals per week, might entail a serious loss to him.

(*b*) While all cases of generalized somatic cestode infection, or cases which are potentially generalized, could best be excluded from use as meat, no hygienic ground is apparent for not permitting the carcass, on this account alone, to be used for lard.

(*c*) No hygienic reason seems to justify condemnation of the light infections mentioned in (2) and (3), but proper measures should be taken to safeguard against any live cysts which might not be found by the inspector.

(*d*) The clauses (2) and (3) have been worded so as to permit less freedom in the use of infected pork than in the use of infected beef, since cold storage is not so satisfactory a method of dealing with

Cysticercus cellulosæ as it is in connection with *C. bovis*, and since, further, *C. cellulosæ* is much more dangerous than *C. bovis*.

(*e*) Since the Department has recently proved that the gid bladder-worm exists in this country, it seems advisable to set an example to State and local authorities by initiating a plan which will inhibit the spread of this parasite.

(*f*) Unless some movement is initiated looking to a prevention of hydatid disease, this malady may cause serious loss of life among both men and live stock. It would therefore seem wise for the Department to set an example to State and local authorities in this respect.

OTHER CONDITIONS.

It is recommended that Regulation 15 (*p*, *t*, and *u*) be amended to read as follows:

Regulation 15 (*p*). *Infections that may cause meat poisoning.*—All carcasses of animals so infected that consumption of the meat or meat food products thereof may give rise to meat poisoning shall be condemned.

This covers all carcasses showing signs of septicemia or pyemia, whether puerperal, traumatic, or without any evident cause; severe hemorrhagic or gangrenous enteritis or gastritis; acute inflammation of the lungs, pleura, pericardium, peritoneum, or meninges; acute diffuse metritis or mammitis; polyarthritis; phlebitis of the umbilical veins; traumatic pericarditis; and any other inflammation, abscess, or suppurating sore if associated with acute nephritis, fatty and degenerated liver, swollen, soft spleen, marked pulmonary hyperemia, general swelling of lymphatic glands, and diffuse redness of the skin, either singly or in combination.

Immediately after slaughter of any animal so diseased the premises and implements used must be thoroughly disinfected as prescribed elsewhere in these regulations.

The part of any carcass coming into contact with the carcass or any part of the carcass of any animal covered by this regulation, or with the place where such animal was slaughtered, or with the implements used in the slaughter, before thorough disinfection of such place and implements has been accomplished, or with any other contaminated object, shall be condemned; in case the contaminated part is not removed from the carcass within two hours after such contact, the whole carcass shall be condemned.

(*t*) *Tumors.*—Any organ or part of a carcass which is the seat of tumor, malignant or benign, shall be condemned.

(1) *Melanosis, pseudoleukemia.*—Carcasses of animals showing any disease such as generalized melanosis, leukemia, pseudoleukemia, etc., which affects the system of the animal, shall be condemned.

(*u*) *Flukes.*—Any organ (lungs, liver, spleen, etc.) or part of a carcass which is infested with flukes (Trematoda) shall be condemned.

MISCELLANEOUS INFORMATION CONCERNING THE LIVE-STOCK INDUSTRY.[a]

THE LIVE-STOCK MARKET IN 1907.

With the exception of the two closing months of the year the state of the live-stock industry in the United States was eminently satisfactory throughout 1907. Prices were so high, in fact, during the greater part of the year that the home market seriously affected the export trade in several products, causing the latter to fall off very considerably. However, unsettled conditions and low prices prevailed toward the end of the year, brought about by the financial stringency on the one hand and the high price of corn on the other. Many holders of live stock were forced by financial necessity to market their animals prematurely, and others followed suit mainly through want of confidence, the result being a market oversupplied with unfinished stock, which was disastrous all around.

The extent of the market depression may be seen from the following average prices of live stock on the Chicago market, taken from trade newspapers: For several months prior to and including October the average prices of medium to prime steers was never lower than $6.30 per hundredweight, but in November the average fell to $5.70, and in December to $5.25. The fall in hog prices was still more pronounced, the average for October being $6.10, forNovember $5, and for December $4.65. The decrease in two months, therefore, amounted to 24 per cent. Sheep and lambs declined in about the same ratio as cattle. Improvement has followed, however, since the close of the year.

It may be of interest to quote here the estimate of the numbers and values of farm animals in the United States on January 1, 1908, as compiled by the Bureau of Statistics of the Department of Agriculture, as follows:

Farm animals.	Number.	Per cent compared with January 1, 1907.	Average price per head.	Total value.
Horses	19,992,000	101.2	$93.41	$1,867,530,000
Mules	3,869,000	101.4	107.76	416,939,000
Milch cows	21,194,000	101.1	30.67	650,057,000
Other cattle	50,073,000	97.1	16.89	845,938,000
Sheep	54,631,000	102.6	3.88	211,736,000
Swine	56,084,000	102.4	6.05	339,030,000

[a] Compiled mainly by John Roberts, of the Editorial Office, Bureau of Animal Industry.

Compared with the previous year all classes except "other cattle" show an increase in numbers. Values, of course, have decreased owing to the financial state of the times, but the decrease is very slight in the case of horses and cattle, and with sheep there is an increase of 4 cents a head. The decrease is much more marked in regard to swine ($1.57 per head), and still more marked with mules ($4.40 per head). The total value of all animals enumerated above on January 1, 1908, was $4,331,230,000.

The magnitude of the part played by live stock in our agriculture is shown by the foregoing figures. It is also evidenced in an investigation made by the United States Bureau of Labor [a] into the living expenses of over 1,000 families of workingmen. From this it is seen that the total average expense for food for each family was $327, and of this $181.33, or rather more than one-half, was expended for meat and other animal products.

Regarding the condition and annual losses of farm animals in the United States, the Bureau of Statistics of this Department estimates that on April 1, 1908, the condition of horses was 96.8 per cent, or 0.7 per cent higher than the average for the past ten years. The estimated losses of horses from disease during the year were 1.7 per cent, which amounted in numbers to 342,000. The condition of cattle was 96.2 per cent, which is 2 per cent higher than the ten-year average, while the number lost from exposure and disease was 3.1 per cent, or 2,203,000. The condition of sheep was 96.7, which was unusually satisfactory, being 2 per cent above the ten-year average. The year's losses of sheep from exposure and disease was 4.5 per cent, or 2,478,000. The condition of hogs was 95.3 per cent, which was 1.6 per cent above the ten-year average, and the losses from disease 5.2 per cent, or 2,940,000.

MARKET PRICES OF LIVE STOCK.

In the following tables are shown the monthly and annual average prices of the various market classes of farm live stock at two of the principal centers, Chicago and Omaha. These figures, excepting the first table, are compiled from official reports of the stock-yard companies at the cities named. Only the first table gives average prices, all the others showing the high and low range. It will be understood, of course, that the mean between the high and low range does not necessarily give the true average price.

[a] Bulletin 65, Bureau of Labor.

Average prices, per hundredweight, of live stock at Chicago in 1907, by months, and annual average, 1894–1907.

[From the Weekly Live Stock Report.]

Month.	Cattle.			Hogs.	Sheep.	Western lambs.
	Natives.	Texans.	Westerns.			
January	$5.80	.....	.....	$6.60	$5.20	$7.30
February	5.60	$4.75	.....	7.05	5.25	7.30
March	5.75	5.20	.....	6.65	5.65	7.60
April	5.85	.....	.....	6.65	5.85	8.05
May	5.80	.....	.....	6.40	5.85	7.80
June	6.40	5.50	.....	6.10	6.00	7.20
July	6.70	5.35	.....	6.05	5.40	7.05
August	6.55	4.40	$5.10	6.00	5.40	6.90
September	6.50	4.75	4.70	6.00	5.20	6.90
October	6.30	4.55	4.35	6.15	4.90	6.80
November	5.60	.....	4.25	4.90	4.35	6.05
December	5.30	.....	4.20	4.70	4.25	5.70
Annual average:						
1907	6.00	4.85	4.50	6.10	5.25	7.10
1906	5.60	4.45	4.40	6.25	5.30	6.90
1905	5.05	4.20	3.80	5.25	5.05	6.90
1904	5.10	4.10	3.65	5.15	4.30	5.65
1903	4.80	3.95	3.65	6.00	4.10	5.45
1902	6.75	4.80	4.95	6.85	4.30	5.50
1901	5.25	4.20	4.55	5.85	3.85	4.85
1900	5.15	4.20	4.35	5.05	4.55	5.95
1899	5.30	4.35	4.60	4.05	4.30	5.50
1898	4.65	4.05	4.20	3.85	[a] 4.25	[a] 5.35
1897	4.50	3.75	3.90	3.70	[a] 3.85	[a] 4.95
1896	4.05	3.35	3.50	3.50	[a] 3.20	[a] 4.50
1895	4.50	3.65	3.75	4.30	[a] 3.30	[a] 4.55
1894	4.25	3.20	3.60	5.05	[a] 2.80	[a] 4.35

[a] Natives.

Range of prices, per hundredweight, of cattle at Chicago and Omaha in 1907, by months, and annual range at Chicago, 1892–1907.

[Compiled from reports of stock-yard companies.]

CHICAGO.

Month.	Native steers (1,500–1,800 pounds).	Native steers (1,200–1,500 pounds).	Poor to best cows and heifers.	Native stockers and feeders.	Texas and western steers.
January	$5.50–$7.30	$4.40–$7.20	$2.60–$5.85	$2.00–$5.00	$3.75–$5.00
February	5.40– 7.25	4.25– 7.00	2.50– 5.30	2.00– 4.90	4.00– 4.80
March	5.70– 6.85	4.35– 6.90	2.75– 5.60	2.00– 5.25	4.50– 5.30
April	5.35– 6.70	4.75– 6.75	2.85– 5.75	2.50– 5.35	3.50– 5.25
May	4.45– 6.50	4.80– 6.50	2.75– 5.65	2.20– 5.25	4.00– 5.10
June	6.00– 7.10	5.10– 7.05	2.60– 5.75	2.25– 5.30	3.75– 5.25
July	6.40– 7.50	5.20– 7.40	2.65– 6.15	2.00– 5.30	3.45– 5.80
August	6.40– 7.60	5.05– 7.50	2.50– 6.25	2.00– 5.20	3.50– 6.75
September	6.25– 7.35	4.80– 7.25	2.50– 6.00	2.00– 5.20	3.10– 6.40
October	6.25– 7.40	4.50– 7.45	2.35– 5.75	2.00– 4.80	3.15– 6.15
November	5.50– 7.15	4.20– 7.25	2.35– 5.90	2.00– 4.60	3.00– 5.40
December	5.30– [a]8.00	3.95– 7.30	2.50– 5.60	2.00– 4.50	3.00– 5.10
Annual range:					
1907	5.30– [a]8.00	3.95– 7.50	2.35– 6.25	2.00– 5.35	3.00– 6.75
1906	4.75–[a]10.50	3.90–[b]17.00	2.40– 6.60	1.75– 5.10	2.90– 6.35
1905	4.40– [a]8.65	3.00– [a]8.45	2.25– 6.80	1.50– 5.45	2.60– 5.25
1904	4.35–[c]10.50	3.35–[d]12.25	2.00– 7.50	1.50– 5.50	2.40– 5.65
1903	4.10– 7.55	3.35– [e]8.35	2.50– 5.50	1.50– 5.20	2.55– 5.10
1902	4.25–[f]14.50	3.60– 9.00	3.35– 8.25	1.90– 6.00	2.55– 7.65
1901	4.75– 9.30	3.60– 12.00	2.00– 8.00	1.65– 5.15	2.75– 5.75
1900	4.70–[g]15.50	3.90– 11.00	1.75– 6.00	2.10– 5.25	3.00– 5.90
1899	4.60– 8.50	4.00– 8.25	2.00– 6.85	2.50– 5.40	3.10– 6.75
1898	4.10– 6.25	3.80– 6.15	2.00– 5.40	2.50– 5.40	3.15– 5.40
1897	4.00– 6.00	3.35– 6.00	1.75– 5.40	2.40– 4.75	2.75– 4.90
1896	3.40– 6.50	2.90– 6.25	1.75– 4.40	2.20– 4.10	2.10– 5.50
1895	4.60– 6.60	2.90– 6.40	2.00– 5.75	2.25– 5.15	2.25– 5.75
1894	3.00– 6.60	2.90– 6.00	1.75– 4.40	2.00– 4.15	2.50– 5.00
1893	4.00– 6.75	2.90– 6.50	2.00– 5.00	2.25– 4.90	3.50– 6.00
1892	3.75– 7.00	2.86– 6.35	1.85– 4.00	2.00– 4.10	1.50– 5.25

[a] International show cattle.

[b] This price, $17 per 100 pounds, was paid for the grand-champion load of 2-year-old Angus, averaging 1,438 pounds.

[c] $10.50 paid for the grand-champion load of the international of 1904.

[d] $12.25 paid for the champion load of Angus yearlings at the international of 1904.

[e] The top price, $8.35, was attained by one load of yearling Hereford steers, averaging 1,099 pounds.

[f] One load of Aberdeen-Angus steers, averaging 1,510 pounds, sold at $14.50.

[g] Fifteen Aberdeen-Angus steers, averaging 1,492 pounds, sold at $15.50.

Range of prices, per hundredweight, of cattle in Chicago and Omaha in 1907, by months, and annual range at Chicago, 1892–1907—Continued.

OMAHA.

Month.	Native beeves.	Native cows.	Stockers and feeders.	Western steers.	Western cows.
January	$3.10–$6.10	$1.85–$4.80	$2.25–$5.35	$3.85–$4.95	$2.25–$4.30
February	3.20– 5.85	2.10– 4.50	2.25– 5.10	3.70– 4.60	2.35– 3.90
March	3.25– 5.80	2.20– 4.75	2.40– 5.00	4.00– 4.85	2.45– 3.85
April	3.80– 5.85	2.25– 5.15	2.90– 5.30	3.65– 5.10	2.50– 4.40
May	3.75– 6.10	2.00– 5.10	3.00– 5.00	.....	.....
June	4.25– 6.75	1.75– 5.15	3.75– 5.10	.....	.....
July	3.25– 7.10	2.20– 5.25	3.05– 5.05	2.90– 5.75	2.05– 4.95
August	3.35– 7.30	2.15– 5.50	2.40– 5.60	2.90– 5.65	2.15– 4.55
September	5.25– 7.10	2.40– 5.25	2.80– 5.55	3.60– 5.90	2.10– 4.15
October	4.25– 7.05	2.25– 3.90	2.75– 5.35	2.85– 6.35	1.40– 4.20
November	3.50– 6.40	2.00– 4.00	2.50– 5.00	2.75– 4.90	1.50– 3.75
December	3.15– 5.70	1.50– 4.15	2.50– 4.30	2.60– 4.90	1.40– 3.80

Range of prices, per hundredweight, of hogs at Chicago and Omaha in 1907, by months, and annual range at Chicago, 1892–1907.

[Compiled from reports of stock-yard companies.]

CHICAGO.

Month.	Heavy packing (250–500 pounds).	Mixed packing (200–250 pounds).	Light bacon (150–200 pounds).
January	$6.15–$7.05	$6.15–$7.02½	$6.15–$7.00
February	6.80– 7.25	6.75– 7.22½	6.70– 7.17½
March	5.95– 7.10	6.00– 7.10	6.05– 7.10
April	6.20– 6.90	6.30– 6.90	6.35– 6.87
May	5.80– 6.60	5.95– 6.62½	6.00– 6.65
June	5.40– 6.35	5.65– 6.40	5.75– 6.42½
July	5.15– 6.40	5.45– 6.65	5.65– 6.65
August	5.20– 6.40	5.40– 6.70	5.80– 6.72½
September	5.25– 6.80	5.50– 7.00	5.90– 6.97½
October	5.25– 7.00	5.35– 7.00	5.40– 7.00
November	3.75– 6.30	3.75– 6.32½	3.70– 6.25
December	4.10– 5.30	4.10–a5.75	4.00– 5.25
Annual range:			
1907	3.75– 7.25	3.70– 7.22½	3.70– 7.17½
1906	5.00– 7.00	4.95–a7.10	4.90– 7.00
1905	4.35– 6.40	4.25– 6.42½	4.10– 6.45
1904	4.10– 6.30	4.15– 6.37½	4.00– 6.30
1903	3.85– 7.87½	3.90– 7.80	3.90– 7.70
1902	5.70– 8.25	5.65– 8.20	5.40– 7.95
1901	4.80– 7.37½	4.85– 7.30	4.75– 7.20
1900	4.15– 5.85	4.15– 5.82½	4.10– 5.75
1899	3.35– 4.95	3.40– 5.00	3.30– 5.00
1898	3.10– 4.80	3.10– 4.70	3.10– 4.65
1897	3.00– 4.45	3.20– 4.50	3.20– 4.65
1896	2.40– 4.45	2.75– 4.45	2.80– 4.45
1895	3.20– 5.45	3.25– 5.55	3.25– 5.70
1894	3.90– 6.75	3.90– 6.55	3.50– 6.45
1893	3.80– 8.75	4.25– 8.65	4.40– 8.59
1892	3.70– 7.90	3.60– 6.85	3.60– 6.85

[a] This price was paid for hogs at the International Live Stock Exposition.

OMAHA.

Month.	Heavy packing (275–500 pounds).	Mixed packing (230–270 pounds).	Light bacon (150–225 pounds).
January	$6.17½–$6.90	$6.20 –$6.90	$6.15 –$6.85
February	6.75 – 7.05	6.72½– 6.95	6.67½– 6.95
March	6.00 – 6.90	6.00 – 6.87½	6.00 – 6.85
April	6.20 – 6.50	6.27½– 6.50	6.30 – 6.55
May	5.77½– 6.40	5.85 – 6.40	5.85 – 6.50
June	5.70 – 6.10	5.75 – 6.15	5.80 – 6.20
July	5.50 – 6.05	5.55 – 6.10	5.65 – 6.30
August	5.35 – 5.95	5.45 – 6.00	5.60 – 6.25
September	5.40 – 6.00	5.50 – 6.10	5.80 – 6.35
October	5.25 – 6.20	5.35 – 6.25	5.35 – 6.50
November	3.90 – 5.72½	3.90 – 5.70	3.80 – 5.75
December	4.20 – 4.80	4.20 – 4.75	4.10 – 4.70

Range of prices, per hundredweight, of sheep at Chicago and Omaha in 1907, by months, and annual range at Chicago, 1892–1907.

[Compiled from reports of stock-yard companies.]

CHICAGO.

Month.	Native sheep (60–140 pounds).	Native yearlings and lambs.	Western sheep (70–140 pounds).	Western and Mexican lambs.
January	$3.00–$6.00	$5.35–$7.90	$2.25–$5.85	$6.00– $7.85
February	2.75– 6.00	5.00– 7.65	3.00– 6.00	6.00– 7.65
March	3.00– 6.00	5.50– 8.00	3.50– 6.50	6.00– 8.15
April	3.50– 6.00	5.50– 8.50	3.80– 7.25	5.75– 8.80
May	3.50– 6.50	5.50– 7.75	4.00– 7.00	5.75– 8.80
June	3.00– 7.00	5.00– 8.60	3.50– 7.00	5.50– [a]9.25
July	3.25– 6.00	5.00– 7.75	3.50– 6.15	6.25– 8.00
August	3.00– 6.00	4.50– 7.65	3.50– 6.00	5.75– 7.85
September	3.00– 6.00	4.50– 7.70	3.00– 6.00	6.00– 7.70
October	2.50– 5.75	4.00– 7.65	2.00– 5.65	5.25– 7.60
November	2.00– 5.25	4.00– 7.10	2.00– 5.25	4.00– 6.65
December	2.00– 5.25	4.25– 7.00	2.00– 5.25	4.00– 7.00
Annual range:				
1907	2.00– 7.00	4.00– 8.60	2.00– 7.25	4.00– 9.25
1906	3.00– 6.50	5.00– 8.50	3.00– 7.00	4.75–[b]11.25
1905	2.75– 6.35	4.00– 8.25	3.15– 6.35	4.50– 8.20
1904	1.50– 6.00	2.50– 7.75	2.00– 5.80	3.00– 7.50
1903	1.25– 7.00	2.50– 8.00	2.00– 7.00	2.50– 7.90
1902	1.25– 6.50	2.00– 7.25	1.25– 6.30	2.50– 7.60
1901	1.40– 5.25	2.00– 6.25	1.50– 5.25	2.75– 5.90
1900	2.00– 6.50	3.00– 7.60	3.00– 6.50	4.00– 7.60
1899	2.25– 5.65	3.50– 7.45	2.50– 5.55	4.00– 7.00
1898	2.00– 5.25	3.50– 7.10	3.00– 5.25	3.75– 6.75
1897	1.25– 5.25	3.00– 6.40	2.15– 5.35	3.50– 7.25
1896	1.00– 4.60	2.75– 6.50	2.15– 4.30	3.50– 6.25
1895	1.25– 5.50	2.25– 6.35	2.50– 5.35	3.00– 6.00
1894	1.00– 5.40	2.00– 6.00	2.00– 5.40	2.50– 5.80
1893	1.50– 6.25	2.25– 7.55	2.50– 6.45	2.25– 6.75
1892	2.25– 6.90	3.00– 8.25	3.00– 6.75	3.50– 7.25

[a] Highest on record for Colorado Mexicans.
[b] International show lambs sold at auction December 6 at $11.25, the highest on record. They were range bred.

OMAHA.

Month.	Native sheep.	Native lambs.	Western sheep.	Western lambs.
January	$3.50–$6.30	$5.50–$7.65	.....	.....
February	3.75– 6.45	5.75– 7.55	.....	.....
March	3.00– 6.50	6.00– 7.90	.....	.....
April	4.00– 7.75	6.25– 8.60	.....	.....
May	4.40– 6.75	6.00– 8.60	.....	.....
June	4.50– 6.75	6.50– 8.75	.....	.....
July	4.00– 6.25	5.60– 7.25	$3.80–$6.00	$4.50–$7.80
August	3.50– 6.50	4.05– 7.50	4.00– 6.25	6.15– 7.50
September	3.75– 4.65	5.50– 7.35	3.25– 6.00	5.25– 7.25
October	4.00– 5.50	5.25– 5.75	3.50– 5.85	5.25– 7.15
November	3.75– 5.20	5.00– 6.25	3.50– 4.80	4.75– 6.25
December	3.00– 5.00	4.00– 6.25	3.50– 4.90	4.50– 5.75

Spring lambs (April), $15.

Average prices of horses at Chicago and range of prices at Omaha in 1907, by months, and annual average at Chicago, 1900–1907.

[Compiled from reports of stock-yard companies.]

CHICAGO.

Month.	Draft horses.	Carriage pairs.	Drivers.	General use.	Bussers and trammers.	Saddlers.	Southern chunks.
January	$187	$440	$160	$135	$147	$167	$77
February	195	500	162	140	155	175	85
March	197	510	167	145	160	185	87
April	197	515	170	147	165	187	87
May	192	510	170	145	160	185	85
June	190	495	165	140	155	180	82
July	190	490	160	140	155	175	80
August	190	490	160	140	155	175	80
September	180	475	155	135	150	165	70
October	175	460	150	130	145	160	67
November	170	450	145	125	140	155	65
December	170	450	145	125	140	155	65
Annual average:							
1907	194	482	165	137	152	172	77½
1906	188	486	158	154	147	174	72½
1905	186	486	156	132	145	172	70½
1904	177	475	150	140	140	160	64
1903	171	455	150	122	140	156	62
1902	166	450	145	117	135	151	57
1901	157	400	137	102	121	147	52
1900	155	410	140	105	115	150	50

OMAHA.

Month.	Draft horses.	Carriage pairs.	Drivers.	General use.	Chunks.	Western.	Southern.
January	$160–$300	$300–$450	$110–$200	$100–$150	$125–$165	$10– $50	$65–$115
February	165– 320	300– 450	110– 200	100– 150	125– 165	10– 50	65– 115
March	175– 325	300– 450	125– 225	110– 160	135– 175	10– 50	75– 125
April	185– 350	300– 475	140– 300	115– 165	140– 185	10– 50	80– 135
May	200– 400	325– 750	160– 425	125– 175	150– 220	10– 60	80– 135
June	185– 375	325– 750	160– 400	135– 175	140– 200	20– 120	85– 140
July	175– 350	300– 600	160– 400	130– 165	125– 170	35– 125	75– 125
August	165– 300	300– 500	160– 350	125– 150	110– 150	30– 150	50– 110
September	150– 275	300– 450	150– 325	125– 150	115– 160	35– 160	65– 110
October	150– 250	300– 475	140– 300	125– 150	115– 160	15– 125	70– 115
November	165– 275	300– 450	85– 185	110– 140	110– 150	10– 80	65– 85
December	150– 250	300– 450	110– 200	95– 145	100– 140	10– 50	65– 85

THE FEDERAL MEAT INSPECTION.

The table which follows gives the number of each of the different classes of live stock slaughtered during the calendar year 1907 at all abattoirs having Government inspection. This is the first full year for which such figures can be given since the new meat-inspection law of June 30, 1906, went fully into effect.

The inspection work for the year was conducted at 702 establishments in 196 cities. This number of cities, however, does not appear in the table, the difference arising from the fact that Government inspection is maintained at a number of places where no slaughtering is done. In such cases the meat is brought from other establishments for the purpose of canning, etc., and these processes are supervised under the new law, as well as the actual slaughtering.

Total number of food animals slaughtered under Government inspection during calendar year 1907, by cities.

City and State.	Cattle.	Calves.	Hogs.	Sheep.	Goats.
	Number.	*Number.*	*Number.*	*Number.*	*Number.*
Albert Lea, Minn.	589	560	1,303	161	2
Allentown, Pa.	11,685	938	79,377	1,668	.....
Alton, Ill.	1,240	293	38,356	137	.....
Arkansas City, Kans.	1,763	91	14,182	9	.....
Auburn, Me.	455	196	19,552	670	.....
Austin, Minn.	919	405	186,470	368	.....
Baltimore, Md.	52,347	1,731	559,969	21,635	4
Bangor, Me.	454	1,145	736	26,482	1
Billings, Mont.	3,089	635	4,021	2,941	.....
Binghamton, N. Y.	8	.....	27	.....	.....
Bishop, Cal.	109	12	87	669	.....
Bloomington, Ill.	.....	.....	67,105	.....	.....
Boston, Mass.	52,898	81,299	1,183,718	307,659	517
Bridgeport, Conn.	.....	3	.....	.....	.....
Bridgeport, Pa.	716	113	24,023	.....	.....
Brightwood, Mass.	1,151	933	152,435	40	.....
Brooklyn, N. Y.	24,747	43,517	1	187,282	1
Buffalo, N. Y.	96,985	38,212	804,830	186,976	.....
Burlington, Iowa.	778	523	7,028	116	.....
Burlington, Vt.	264	12	166	3	.....
Cairo, Ill.	2,066	660	6,695	176	15
Cedar Rapids, Iowa.	22,728	566	588,826	2,180	8
Charleston, Tenn.	.....	.....	1,155	.....	.....
Chattanooga, Tenn.	10	.....	8	.....	.....
Chester, Pa.	3,711	575	27,079	7,757	.....
Cheyenne, Wyo.	1,101	54	2,481	837	.....
Chicago, Ill.	1,844,269	389,977	5,982,615	3,050,378	12,630
Cincinnati, Ohio.	126,743	60,303	599,170	52,436	134
Claremont, N. H.	23	42	871	74	.....
Cleveland, Ohio.	68,734	41,904	647,056	93,715	18
Coffeyville, Kans.	1,115	104	1,451	1	.....
Columbus, Ga.	118	160	186	34	7
Columbus, Ohio.	4,472	241	45,594	31	.....
Corning, N. Y.	45	18,138	569	974	.....
Cortland, N. Y.	197	11,742	13,257	5,195	9
Danville, Ill.	135	95	448	.....	.....
Davenport, Iowa.	209	341	39,955	63	.....
Dayton, Ohio.	11,693	4,627	119,170	4,594	.....
Decatur, Ind.	131	72	1,954	3	.....
Denver, Colo.	39,553	3,461	216,959	22,692	75
Des Moines, Iowa.	26,812	523	238,226	49	.....
Detroit, Mich.	20,618	11,315	353,378	24,752	.....
Dubuque, Iowa.	.....	19	12,999	.....	.....
Duluth, Minn.	6,134	3,572	9,177	4,045	1
Eau Claire, Wis.	231	79	43,328	532	.....
Evansville, Ind.	11,052	4,536	38,593	1,824	35
Fall River, Mass.	51	13	.....	.....	.....
Fergus Falls, Minn.	210	85	4,759	127	.....
Fort Atkinson, Wis.	.....	.....	6,320	.....	.....
Fort Madison, Iowa.	.....	.....	40,796	.....	.....
Fort Wayne, Ind.	4,367	2,029	34,932	934	.....
Fort Worth, Tex.	402,812	239,107	445,360	55,658	217
Greeneville, Tenn.	.....	.....	1,321	.....	.....
Hamilton, Ohio.	613	316	8,812	187	.....
Harrisburg, Pa.	2,802	1,143	21,492	1,374	4
Hartford, Conn.	.....	6	.....	.....	.....
Haverhill, Mass.	791	3,934	3,363	39,280	18
Houlton, Me.	.....	13	.....	9,547	.....
Houston, Tex.	24,808	5,822	32,054	1,906	.....
Hutchinson, Kans.	5,955	677	71,609	.....	.....
Indianapolis, Ind.	186,843	32,980	1,569,054	19,560	.....
Jacksonville, Ill.	2,937	231	11,973	514	84
Jefferson, Wis.	196	638	5,953	.....	.....
Jefferson City, Tenn.	.....	.....	222	.....	.....
Jersey City, N. J.	21,633	61,734	751,332	244,921	108
Kansas City, Kans.	1,269,368	158,860	3,232,882	1,050,279	32,733
Knoxville, Tenn.	60	5	384	.....	.....
La Crosse, Wis.	877	682	7,011	378	.....
Lafayette, Ind.	5,481	2,692	40,960	1,110	5
Lewiston, Idaho.	411	193	660	365	.....
Logansport, Ind.	457	224	19,301	11	.....
Los Angeles, Cal.	80,661	8,379	99,308	220,747	69
Louisville, Ky.	9,997	35	195,474	968	.....
Madison, Ind.	480	1,098	3,618	174	.....
Mankato, Minn.	2,176	1,601	3,070	1,311	.....
Marshalltown, Iowa.	1,887	235	121,261	29	.....
Mason City, Iowa.	344	211	46,102	.....	.....
Milwaukee, Wis.	67,560	44,164	1,238,918	31,848	.....

Total number of food animals slaughtered under Government inspection during calendar year 1907, by cities—Continued.

City and State.	Cattle.	Calves.	Hogs.	Sheep.	Goats.
	Number.	*Number.*	*Number.*	*Number.*	*Number.*
Morristown, Tenn	1		3,750		
Nashville, Tenn	3,452	1,033	12,851	2,150	49
National Stock Yards, Ill	458,456	109,538	1,047,618	365,775	4,031
Nebraska City, Nebr	26		200,778		
Newark, N. J	15,136	11,837	516,142	54,637	
New Haven, Conn			161,738		
New Orleans, La	55,826	3,661	8,043	711	129
New York, N. Y	483,384	282,229	871,385	1,436,552	52
Ogden, Utah	5,214	964	4,466	5,980	
Oklahoma City, Okla	729	159	2,698	78	
Olathe, Kans		68	1,800		
Ottumwa, Iowa	11,664	1,832	648,880	1,990	19
Paris, Ill	265	143	2,292		
Paterson, N. J	7,300	5,705	122,403	43,576	
Peoria, Ill	8,040	3,417	90,331	897	13
Philadelphia, Pa	98,028	40,848	386,543	216,358	9
Pittsburg, Kans	4,812	552	16,059	114	
Pittsburg, Pa	56,906	41,123	353,413	70,600	
Port Huron, Mich			33,047		
Portland, Oreg	36,853	2,462	48,093	67,282	
Pottsville, Pa	975	284	89,566	66	
Providence, R. I		15	93,646	8	
Pueblo, Colo	4,397	2,858	27,013	4,558	174
Quincy, Ill	3,112	1,006	47,527	496	5
Reno, Nev	7,794	2,787	7,446	19,499	
Richmond, Ind	1,002	716	5,246	233	
Richmond, Va	2,519		50,974	2	
Saegertown, Pa	26	41	273	1	
St. Louis, Mo	199,192	28,175	726,089	70,035	1,455
San Antonio, Tex	5,749	5,701	7,888		20
San Diego, Cal	5,322	163	4,365	12,324	31
San Francisco, Cal	94,350	19,456	66,645	276,094	532
Savannah, Ga	90				
Scranton, Pa	1,356	152	23,201	3,705	7
Seattle, Wash	40,920	57	83,860	79,211	
Silvers Mills, Me		93		5,127	
Sioux City, Iowa	156,249	2,612	1,044,720	24,731	1
Southboro, Mass			3,661		
South Omaha, Nebr	719,634	50,928	2,128,416	1,002,084	544
South St. Joseph, Mo	402,414	53,736	1,788,052	566,278	1,747
South St. Paul, Minn	99,901	33,442	867,410	119,011	18
Spokane, Wash	10,576	1,232	25,784	14,303	
Springfield, Ohio	321	54	4,414	33	
Tacoma, Wash	31,420	1,883	37,528	56,811	996
Toledo, Ohio	3,613	225	70,921	183	
Topeka, Kans	7,954	1,406	113,218	367	23
Trenton, N. J	1,427	820	538	1,454	
Troy, N. Y	2,014	5	6,698	210	
Walla Walla, Wash	587	166	2,008	668	
Washington, D. C	16,301	9,381	115,523	28,526	168
Waterloo, Iowa	784	364	60,066	1	
West Newbury, Mass	1,074	850	286	23	1
Wheeling, W. Va	7,199	5,643	113,590	4,683	
Whitesburg, Tenn			850		
Wichita, Kans	15,152	2,047	404,126	625	31
Wilmington, Del	7,733	912	19,134	3,460	
Winona, Minn	239	175	19,562	174	
Worcester, Mass	3		139,918		
Total	7,633,365	2,024,387	32,885,377	10,252,070	56,750

It is interesting to compare the totals in the foregoing table with the corresponding figures for the fiscal year ended June 30, 1906, which was the last under the old law. The latter were: Cattle, 6,925,526; calves, 1,102,775; hogs, 26,649,353; sheep, 8,223,630; a total of 42,901,284 animals, which were inspected at 163 establishments in 58 cities.

On comparing these with the figures for 1907, shown in the table, it is seen there was an increase of 707,839 cattle, or 10.22 per cent; 921,612 calves, or 83.57 per cent; 6,236,024 hogs, or 23.40 per cent; 2,028,440 sheep, or 24.67 per cent; and a total increase of 9,950,665 animals, or 23.19 per cent.

Further information concerning the meat inspection is given in the report of the Chief of the Bureau of Animal Industry for the fiscal year ended June 30, 1907, on pages 18–23 of this volume.

OUR FOREIGN TRADE IN ANIMALS AND ANIMAL PRODUCTS.

Our exports of animals, meats, and other animal products have for a long series of years been of such magnitude that the success of our animal industry as a whole has come to depend to a large extent upon the stability of this branch of trade. The salient points concerning our imports and exports in 1907 are as follows:

EXPORTS.

According to the reports of the Bureau of Statistics, Department of Commerce and Labor, the total value of the exports of animals and animal products for the calendar year 1907 amounted to $277,150,618. The exports for the previous year totaled $296,648,466. There was thus a decrease in 1907 of close upon $20,000,000. This loss of trade was probably caused, in part at least, by the high prices in our own markets. With home prices so profitable it did not pay to enter the open market abroad. It should be borne in mind, too, that the total for 1906 was the highest on record; therefore, some reaction was not unnatural. The total for 1907 was, in fact, greater than that of 1905 by about $3,000,000.

The falling off in the trade of 1907 was chiefly confined to bacon, cattle, butter, and, in a lesser degree, to lard, horses, and cheese. There were, on the other hand, substantial increases in the exports of salt pork, oleo oil, lard compounds, and grease. The principal items of exports, in order of magnitude, were lard, cattle, leather, fresh beef, hams, bacon, oleo oil, and salt pork, the values of these items ranging from $55,518,079 for lard to $15,465,072 for salt pork.

The table on the following page presents a comparison of the values of exports of animals and animal products for 1906 and 1907.

Value of exports of animals and animal products for calendar years 1906 and 1907.

[Compiled from reports of the Bureau of Statistics, Department of Commerce and Labor.]

Items.	1906.	1907.	Items.	1906.	1907.
Animals:			Meat products—Cont'd.		
Cattle	$38,273,132	$33,796,425	Beef—Continued.		
Hogs	341,232	304,464	Salted, pickled, and cured	$4,452,362	$3,293,932
Horses	4,914,999	3,608,119	Tallow	5,729,856	6,623,648
Mules	914,839	907,304	Bacon	35,886,152	22,344,365
Sheep	831,495	707,930	Hams	20,986,356	24,213,548
All other, including fowls	339,051	327,419	Pork—		
Bones, hoofs, etc	156,539	206,034	Canned	586,856	362,432
Dairy products:			Fresh	1,216,770	1,224,355
Butter	4,548,366	862,812	Salted and pickled	12,907,344	15,465,072
Cheese	2,628,134	1,260,480	Lard	57,984,829	55,518,079
Milk	1,889,795	2,548,435	Lard compounds and substitutes	4,801,078	6,849,445
Eggs	1,225,708	1,719,433	Lard oil	162,786	145,034
Feathers	301,980	335,137	Other animal oil	267,214	324,735
Glue	311,173	322,939	Mutton	60,445	104,994
Grease and other soap stock	4,250,942	6,163,739	Poultry and game	1,401,784	1,161,789
Hair and hair manufactures	863,027	1,102,520	Sausage and sausage meats	935,288	895,685
Hides and skins (other than furs)	1,877,388	1,293,380	Sausage casings	2,920,703	3,799,904
Leather:			All other meat products	3,595,750	3,886,604
Sole	8,062,649	6,757,306	Oleo oil	16,936,026	18,348,208
Upper	22,586,643	19,158,010	Oleomargarin	870,910	335,550
Other	2,328,305	2,315,673	Wool	67,087	20,667
Meat products:					
Beef—			Total	296,648,466	277,150,618
Canned	3,492,189	2,352,226			
Fresh	24,751,284	26,182,787			

IMPORTS.

With the exception of a very few items our foreign purchases of animals and animal products are quite unimportant. There are, in fact, but two items that stand out prominently—hides and skins, and wool. The annual value of the former usually amounts to more than one-half the entire imports, and when wool is added the proportion rises to four-fifths.

Value of imports of animals and animal products for calendar years 1906 and 1907.

[Compiled from reports of the Bureau of Statistics, Department of Commerce and Labor.]

Items.	1906.	1907.	Items.	1906.	1907.
Animals:			Hair, unmanufactured	$3,297,308	$3,126,236
Cattle	$525,266	$1,111,330	Hides and skins:		
Horses	1,947,872	1,835,555	Goatskins	32,518,896	26,565,334
Sheep	1,132,539	1,034,740	Cattle hides	21,149,829	18,120,638
All other, including fowls	670,149	649,135	All other	30,216,256	32,965,087
Bones, hoofs, etc	953,138	810,863	Hide cuttings	1,306,295	1,514,164
Bristles	3,090,288	2,851,411	Leather:		
Dairy products:			Morocco skins	3,146,516	2,907,468
Butter	75,767	215,868	Upper leather	3,378,080	3,796,389
Cheese	4,874,559	5,957,972	All other	704,969	548,004
Milk	5,634	10,931	Meat products	926,417	824,365
Eggs	21,074	29,014	Sausage casings	987,566	1,950,224
Feathers, crude	3,707,954	4,415,304	Wool	38,361,869	39,673,007
Glue	616,961	659,168			
Grease and oils	1,351,080	1,255,573	Total	154,966,282	152,827,780

The total value of the imports of animal origin for 1907 was $152,827,780, as against $154,966,282 for 1906. On comparing the various items for the two years, as shown in the above table, it is seen that for the most part they are either very similar or are slightly increased in 1907. A pronounced falling off occurred, however, in goat skins, and cattle hides also decreased.

After hides and skins and wool there is a big drop to the next largest item of imports, which in 1907 was cheese. We purchase large quantities of certain European varieties of cheese, and the trade has increased rapidly in recent years.

EXPORTS OF LIVE STOCK FOR TEN YEARS.

As inquiries are often received by the Bureau for detailed information regarding our exports of live stock, and as such information in the form desired is not easily available in other publications, it has been considered of sufficient general interest to prepare the following statement showing the number and value of each class of stock annually exported, together with the countries of destination, for the past ten years. This information has been compiled from reports of the Bureau of Statistics of the Department of Commerce and Labor (formerly Bureau of Statistics of the Treasury Department).

A majority of the food animals enumerated are sent abroad for purposes of immediate slaughter upon reaching the foreign port. Some purebred animals for breeding are included in the figures given, but we have no means of ascertaining what the exact number is.

About 500,000 live cattle are exported annually. Practically all of them are high-grade beef animals, averaging in value between $90 and $100 each. Nearly all are destined for British ports and are slaughtered within a few days after arrival.

Fat hogs are not suitable for transportation long distances, consequently few live hogs are exported. An enormous foreign trade is carried on in hog products, however, so that our surplus of hogs leaves the country in the shape of meat and lard.

The value of the horses exported in the last two years was slightly more than $4,250,000 in each year, which was fully $1,000,000 in excess of the three preceding years. It is a source of satisfaction also that the average price of last year's exports was $129, while those of 1906 averaged but $109, showing a gain of $20 a head. The very heavy exports of horses for several years prior to and including 1902 were caused by the extra demand incident to the South African war.

Sheep exports are not large. There is some trade in good breeding stock, but the majority of the shipments are ordinary animals which are sent to Canada and Mexico.

Exports of live domestic animals from the United States by countries, years ending June 30, 1898–1907.

CATTLE.

Countries.	1898.		1899.		1900.		1901.		1902.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Europe:										
Belgium							230	$23,000	826	$82,600
Germany					500	$50,000	46	3,220		
Netherlands							345	31,050		
United Kingdom	378,956	$35,431,464	308,126	$28,213,572	302,195	27,935,747	376,380	35,311,949	284,999	27,114,151
North America:										
Bermuda	1,657	124,694	1,617	130,375	1,669	128,830	1,575	114,952	2,239	174,659
British Honduras	42	2,018	7	135			159	7,169	52	1,454
Canada	15,804	1,068,139	3,709	221,037	5,233	306,645	13,333	605,907	18,780	719,761
Newfoundland and Labrador	1	100							17	1,100
Central American States:										
Costa Rica	27	3,280	12	1,330	14	1,200			15	1,980
Guatemala	22	1,070	14	420			3	425		
Honduras			24	1,325			16	500		
Nicaragua			2	275			6	520	12	980
Salvador	7	690			1	50			7	600
Mexico	1,953	78,400	2,301	98,920	3,761	152,131	2,608	126,628	4,728	225,138
West Indies—British	270	21,899	244	16,994	177	12,355	141	9,317	1,331	62,844
Cuba	40,186	1,085,299	72,890	1,802,149	83,649	2,042,710	63,392	1,261,027	78,023	1,441,840
Danish	1	40							120	3,400
French							12	500	804	31,562
Haiti	5	225	6	440	1	80			3	180
Santo Domingo									2	90
South America:										
Argentina	3	1,200	10	3,025						
Brazil	8	700			7	490	948	68,511	170	13,600
Chile									1	175
Colombia	267	4,880	209	1,896			6	310	19	1,175
Ecuador			2	175						
Guiana—Dutch							1	80	4	170
Peru									1	100
Venezuela	7	682	2	97	1	150	6	705	8	440
Asia:										
Chinese Empire			1	125						
Hongkong	1	100	6	300					35	1,760
Japan	13	610	26	3,000	1	50	6	300	4	225
Oceania:										
British Australasia	1	100					2	500		
Hawaii	24	1,910	208	9,870	75	4,215				
British South Africa			74	11,373	2	500	3	410	684	22,228
Total	439,255	35,827,500	389,490	30,516,833	397,286	30,635,153	459,218	37,566,980	392,884	29,902,212

Countries.	1903.		1904.		1905.		1906.		1907.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Europe:										
Belgium	1,824	$186,303	18,350	$1,768,860	7,301	$703,681	9,516	$918,620	8,273	$809,510
Denmark							332	29,980		
Germany									600	48,00
Spain	50	2,250								
United Kingdom	277,226	26,597,390	387,467	36,110,806	391,715	36,722,387	405,277	37,729,300	343,971	31,933,162
North America:										
Bermuda	1,735	124,048	1,683	118,217	1,841	129,874	1,503	109,889	1,131	84,446
British Honduras	13	547	2	65	2	46	5	151	54	3,220
Canada	35,583	1,231,714	38,080	1,492,248	21,056	435,212	15,633	453,350	13,125	335,786
Central American States:										
Costa Rica	26	2,420	3	300	17	780	25	1,500	10	530
Guatemala			3	104	16	850	32	2,815	9	784
Honduras	2	130			19	908	3	232		
Nicaragua	1	50	10	830	11	990	8	401		
Panama			33	1,105	114	4,396	33	1,880	83	4,786
Salvador			2	150	3	495	5	750		
Mexico	4,908	237,008	6,218	341,473	7,947	392,115	18,641	666,962	30,802	836,729
West Indies—British	1,060	53,889	853	43,178	1,186	58,208	572	29,205	96	7,273
Cuba	70,812	1,168,382	134,781	2,166,485	135,421	2,062,483	130,639	1,977,088	24,062	439,795
Danish	136	5,460	90	3,200	14	280	87	2,800	10	359
Dutch	61	2,806	2	75	3	54	1	63		
French	575	26,452	245	15,189	24	1,140				
Haiti	4	320							1	100
Santo Domingo	1	50	15	360	71	2,297	65	2,335	17	660
South America:										
Argentina	2	2,080	3	1,400			30	13,600	14	5,600
Brazil	341	26,300	328	26,330	890	71,668	1,359	104,890	610	47,152
Chile									2	210
Colombia	6	310								
Ecuador	3	400							2	200
Guiana—British							1	200		
Dutch			8	483						
French	751	42,148	172	7,530						
Peru	2	200	7	610					20	2,800
Uruguay									19	4,400
Venezuela	4	236	20	1,292	75	3,664	24	1,367	11	660
Asia:										
Chinese Empire			5	700	14	1,885	48	8,156	20	3,000
Hongkong	12	600	3	200			15	1,500	48	4,810
Japan			25	1,100	22	3,310	78	5,961	57	2,900
Russia—Asiatic							162	6,575	2	100

Exports of live domestic animals from the United States by countries, years ending June 30, 1898–1907—Continued.

CATTLE—Continued.

Countries.	1903.		1904.		1905.		1906.		1907.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Oceania:										
British Australasia	11	$1,800	4	$600			9	$1,000		
French Oceania									1	$70
Philippine Islands			14	1,650	3	$725				
British South Africa	7,029	135,643	4,983	151,751	41	600	136	10,600	1	350
Total	402,178	29,848,936	593,409	42,256,291	567,806	40,598,048	584,239	42,081,170	423,051	34,577,392

HOGS.

Countries.	1898.		1899.		1900.		1901.		1902.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Europe:										
France			98	$1,960						
Italy					10	$85				
Portugal					2	35				
Russia—European			12	300					6	$50
United Kingdom	1,030	$7,987	20	125	2	20				
North America:										
Bermuda	8	83	26	270	24	204	61	$916	117	1,634
British Honduras			10	52			5	25		
Canada	4,039	24,940	1,363	6,847	977	7,022	1,427	12,886	2,352	17,535
Central American States:										
Costa Rica			2	8	2	15	25	300	20	110
Guatemala	2	36	6	18	2	25	8	60	4	32
Honduras	105	1,680					2	40		
Nicaragua							4	40		
Salvador	15	100								
Mexico	4,097	44,487	7,390	87,642	4,777	69,106	2,904	32,709	2,002	25,939
West Indies—British	9	177	9	130	1	26	4	80	6	104
Cuba	1,426	11,109	17,908	95,446	42,644	299,623	17,851	190,748	3,826	42,023
Danish							2	8		
Dutch			2	10						
French	13	75								
Haiti			4	70			2	20	2	18
Santo Domingo	7	112								

South America:										
Argentina	4	100							7	275
Bolivia									10	160
Brazil	2	32	24	1,000			2	40	8	150
Chile									5	100
Colombia	3	40	8	137	3	25	10	135		
Ecuador			2	60						
Guiana—British							1	30		
French			6	30						
Peru							1	50		
Venezuela	15	316	2	26					3	200
Asia: Japan					35	150				
Oceania:										
British Australasia	4	100					4	200		
German Oceania							2	50		
Hawaii	3,632	19,113	6,139	33,110	2,699	18,427				
British South Africa					2	50	3	128		
Total	14,411	110,487	33,031	227,241	51,180	394,813	22,318	238,465	8,368	88,330

Countries.	1903.		1904.		1905.		1906.		1907.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Europe:										
Azores, and Madeira Islands	6	$82					2	$32		
Belgium			1,450	$11,600						
Portugal	6	34	2	32						
United Kingdom					350	$3,306	692	$6,920	776	$4,874
North America:										
Bermuda	366	4,181	155	1,660	127	1,235			12	98
British Honduras			2	16	1	20	1	20		
Canada	1,318	11,608	1,971	14,953	32,906	300,712	39,997	406,054	110	1,204
Central American States:										
Costa Rica	13	103	4	29			11	79		
Guatemala			6	82	1	10	9	81	4	60
Honduras	4	24	2	14	1	15	4	30	1	4
Nicaragua	28	138	6	125	6	21	17	430	31	214
Panama			10	150	3	105	4	10	6	78
Salvador			2	60					4	100
Mexico	1,191	11,470	1,201	10,679	6,478	76,720	12,960	167,386	13,516	200,414
West Indies—British	2	54	3	30			22	282	11	111
Cuba	851	11,013	1,482	12,891	4,572	32,845	5,358	45,953	9,614	93,757
Danish	4	47								
French							1	10	6	30
Haiti			2	12	7	112	5	62	1	19
Santo Domingo			7	113	5	55	6	94	8	73

Exports of live domestic animals from the United States by countries, years ending June 30, 1898–1907—Continued.

HOGS—Continued.

Countries.	1903.		1904.		1905.		1906.		1907.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
South America:										
Argentina			5	$400	5	$275	55	$2,750	89	$6,675
Brazil	4	$150	6	101	2	35	17	647	23	516
Chile	8	135								
Colombia	3	51	9	182	7	51			29	503
Ecuador									3	50
Guiana—British	2	30			1	35				
Uruguay									3	250
Venezuela			13	251	11	116	3	48	15	410
Asia:										
Japan					11	1,000	3	450		
Oceania:										
British Australasia			3	300						
All other British Oceania					2	24				
Philippine Islands			4	100						
British South Africa	225	1,803					3	65		
Total	4,031	40,923	6,345	53,780	44,496	416,692	59,170	630,998	24,259	309,190

HORSES.

Countries.	1898.		1899.		1900.		1901.		1902.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Europe:										
Azores, and Madeira Islands					2	$250	2	$400	2	$1,100
Belgium	7,356	$746,025	4,735	$476,600	3,481	357,909	918	91,900	441	50,620
France	72	9,000	2	480	12	19,050	1	75		
Germany	7,913	1,161,750	6,166	921,595	3,647	544,055	869	141,460	122	23,300
Gibraltar					3	2,200				
Italy	203	23,145	89	12,000						
Norway and Sweden			28	2,800						
United Kingdom	22,129	3,072,498	20,929	3,024,952	30,232	4,205,376	22,698	3,481,467	10,015	1,593,304
North America:										
Bermuda	49	8,798	50	6,395	75	9,255	62	5,375	47	8.465
British Honduras	11	350	13	863			11	3,050		
Canada	9,413	874,374	10,088	667,165	8,828	856,981	9,303	863,031	23,182	1,807,998
New Foundland and Labrador	2	300			2	225	2	600	1	300

Central American States:										
Costa Rica	34	3,400	3	650	1	250	34	7,150		
Guatemala	42	3,850	1	30	36	3,600	18	3,625	57	5,967
Honduras	147	5,195	72	4,015	1	50	2	350	1	135
Nicaragua			10	670	1	50			4	2,995
Salvador							5	800	2	500
Mexico	1,297	77,090	1,138	81,849	1,663	120,904	739	65,628	3,763	154,697
West Indies—British	350	40,072	222	25,063	125	12,900	199	26,290	152	26,003
Cuba	1,580	83,310	1,244	115,235	3,247	189,757	4,436	240,894	4,537	215,816
Danish	3	550								
Dutch	2	286			1	130			2	169
French	32	3,401	37	4,005	38	4,845	28	5,470	50	3,579
Haiti	13	2,075	4	615	2	260	1	240	1	200
Porto Rico	7	915	1	1,500	25	2,875				
Santo Domingo	7	1,975	7	1,305			2	600	79	4,907
South America:										
Argentina	1	700								
Brazil					4	1,000	1	200	1	100
Chile			2	200						
Colombia	7	1,050			4	530	3	800	20	2,000
Guiana—British	5	750	12	1,200	8	700	3	525	9	2,585
French			6	720					1	200
Venezuela	8	3,200	13	2,439			18	4,300	25	6,610
Asia:										
Chinese Empire					1	75	2,317	192,050	7	400
East Indies	3	300								
Hongkong	2	500	2	1,000						
Japan			1	225			1,535	153,950	21	16,550
Russia—Asiatic									2	300
Oceania:										
British Australasia			1	500	6	4,300			6	12,000
French Oceania	4	490							1	400
Guam					4	350				
Hawaii	341	33,635	775	73,591	706	74,922				
Philippine Islands					2,347	211,550	1,578	115,160		
Africa:										
British—South	117	17,585	127	16,680	8,199	797,372	37,465	3,468,455	60,469	6,106,810
Portuguese—Africa					2,021	190,895				
Total	51,150	6,176,569	45,778	5,444,342	64,722	7,612,616	82,250	8,873,845	103,020	10,048,046

Exports of live domestic animals from the United States by countries, years ending June 30, 1898–1907—Continued.

HORSES—Continued.

Countries.	1903.		1904.		1905.		1906.		1907.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Europe:										
Belgium	88	$15,132	110	$15,860	96	$19,800	77	$12,750	85	$12,025
Denmark							1	250		
France					5	1,800	142	10,775		
Germany	147	17,925	197	29,153	129	35,300	102	18,113	66	14,900
Gibraltar			1	200						
Italy			4	750					1	300
Norway and Sweden	1	50								
Russia—European	14	1,400					2	3,000	1	300
United Kingdom	3,755	688,940	2,325	412,760	1,635	505,365	916	261,675	791	196,950
North America:										
Bermuda	62	9,000	83	13,468	46	9,442	20	3,525	15	2,350
British Honduras	1	125	3	410			4	400	7	950
Canada	24,965	2,121,864	24,672	2,098,685	18,444	1,877,018	31,916	3,435,504	26,361	3,336,353
New Foundland and Labrador			14	1,300	29	2,750	3	285		
Central American States:										
Costa Rica	2	40			11	2,991	101	10,094	13	1,600
Guatemala			8	1,300	9	1,150	26	4,025	12	900
Honduras			7	1,240			12	1,075		
Nicaragua					2	1,000				
Panama			1	74	9	1,350	10	1,525	53	8,833
Salvador	1	175	1	100	1	225				
Mexico	1,316	92,249	2,262	164,363	2,151	239,078	2,588	299,821	3,134	422,868
West Indies—British	179	26,204	163	28,280	186	38,355	59	11,035	88	18,068
Cuba	3,117	105,469	11,945	380,272	11,718	396,780	4,002	248,154	2,895	287,000
Danish			12	1,458	34	1,335	8	240	6	550
Dutch	1	27			38	1,685				
French	29	1,924	43	7,570	7	1,260	1	100	5	1,225
Haiti	5	2,150	5	1,120			2	500	3	1,500
Santo Domingo	14	845	19	1,605	53	2,812	29	2,775	18	2,400
South America:										
Argentina							4	2,000		
Brazil	3	600	2	350					4	1,350
Colombia	25	1,675	11	850					1	200
Guiana—British			19	2,847	8	1,333	4	950	8	1,500
Dutch			1	140	3	595				
French			6	240						
Peru			2	950			4	1,500	1	500
Uruguay	1	250								
Venezuela			5	2,025	10	3,325	2	525	3	720

Asia:										
Chinese Empire	2	200					1	400	3	300
East Indies	3	650								
Japan	40	16,350	31	5,775	32	8,170	42	32,600	4	1,110
Russia—Asiatic	2	400			6	1,500				
Oceania:										
British Australasia	4	4,700	17	6,900	11	7,800	4	1,750	3	2,000
All other British Oceania							2	135		
French Oceania			4	675	6	450	1	150		
Philippine Islands							2	350		
Africa:										
British—South	180	38,815	28	8,380	143	12,590			301	43,205
Turkish—Egypt	50	5,000								
Total	34,007	3,152,159	42,001	3,189,100	34,822	3,175,259	40,087	4,365,981	33,882	4,359,957

SHEEP.

Countries.	1898.		1899.		1900.		1901.		1902.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Europe:										
Belgium							440	$4,120	200	$1,000
France									198	1,980
Germany	1	$50								
United Kingdom	142,178	1,016,895	98,080	$702,347	73,126	$560,166	219,426	1,655,949	203,880	1,476,577
North America:										
Bermuda	2,130	16,897	1,883	14,864	2,248	20,800	2,570	16,075	2,587	16,351
British Honduras	2	5	25	85			60	255		
Canada	48,325	108,446	34,782	75,323	43,535	98,403	69,669	216,680	146,503	383,225
Central American States:										
Costa Rica	18	72	3	15	13	54	2	12	15	90
Guatemala			8	40						
Honduras							8	18		
Mexico	2,359	9,748	3,235	11,525	3,011	16,931	2,713	7,286	2,116	16,765
West Indies—British	2,853	21,267	1,762	14,277	1,375	11,184	1,478	11,552	1,791	14,382
Cuba	57	537	2,009	5,653	1,236	5,115	467	3,887	291	3,223
Danish					15	86				
Dutch									24	156
French	13	80			5	35				
Haiti	3	90								
South America:										
Argentina	51	1,320	4	400	25	2,500				
Bolivia									24	980
Brazil					5	206	2	85		
Colombia	13	75					3	125		

Exports of live domestic animals from the United States by countries, years ending June 30, 1898-1907—Continued.

SHEEP—Continued.

Countries.	1898.		1899.		1900.		1901.		1902.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
South America—Continued.										
Guiana—British	1,411	$11,014	1,176	$8,220	1,080	$7,997	949	$7,165	941	$7,074
French							3	21	3	32
Peru									2	50
Venezuela									3	75
Oceania:										
British Australasia	183	18,300	55	8,100	98	10.000	82	6,690	58	6,100
French Oceania							2	14		
Hawaii			149	1,466						
Africa:										
British—South	93	9,090	56	5,340			51	3,066	84	12,000
All other Africa			59	5,900						
Total	199,690	1,213,886	143,286	853,555	125,772	733,477	297,925	1,933,000	358,720	1,940,060

Countries.	1903.		1904.		1905.		1906.		1907.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Europe:										
Belgium	298	$2,394	9,809	$77,662	2,074	$17,156				
Gibraltar			2	25						
United Kingdom	111,688	809,782	223,057	1,598,863	185,105	1,373,683	65,318	$486,252	56,387	$413,924
North America:										
Bermuda	4,072	24,479	3,203	20,852	2,846	19,605	2,268	18,249	1,854	16,491
British Honduras					7	15				
Canada	54,371	174,437	60,218	187,742	68,611	202,332	68,951	212,450	63,034	195,655
Central American States:										
Costa Rica	7	25			6	30				
Guatemala					10	100				
Nicaragua	12	40	23	115			4	56		
Panama					10	70	2	22	18	91
Salvador					1	150				
Mexico	3,776	22,442	2,183	25,218	3,621	41,914	4,436	62,599	12,564	90,873
West Indies—British	1,184	9,856	1,649	12,530	1,165	8,821	665	5,018	637	4,892
Cuba	258	2,268	141	648	128	938	168	835	69	869
Danish	124	911	36	206	116	326	118	207	121	207
French					12	114			1	12

South America:										
Argentina									30	8,000
Brazil			1	8					4	165
Chile	100	1,920			7	200				
Guiana—British	852	6,468	691	5,063	461	3,620	503	4,240	303	2,777
Dutch			92	752					10	75
French	10	95								
Peru	14	122	2	70					20	1,000
Uruguay					2	400	12	1,100	49	2,245
Venezuela							5	235	5	250
Oceania:										
British Australasia			61	10,000						
French Oceania							3	27		
Philippine Islands									4	80
British South Africa	195	12,621	145	14,850	4,183	17,847	237	12,800	234	12,636
Total	176,961	1,067,860	301,313	1,954,604	268,365	1,687,321	142,690	804,090	135,344	750,242

HOME AND FOREIGN MEAT PRICES.

The wholesale prices of meats given in the following tables may be of interest as showing the difference in values at the five largest American and European cities selected for comparison. They also show the variation at each place from month to month throughout the year. In the case of Chicago the figures may also be compared with the live-weight prices quoted in another part of this report (pp. 377–379). In connection with this latter comparison, however, it must be remembered that the carcass weight varies considerably from the live weight, and the cost of slaughtering and handling should be taken into consideration also.[a] Fat cattle generally dress about 60 per cent of the live weight, and sheep about 50 per cent, while hogs dress as high as 80 per cent. The remainder, however, is by no means waste. Nothing, in fact, is wasted at a modern abattoir, but of course the by-products are less valuable than the meat. In the case of cattle, for instance, it appears from packing-house statistics that the value of the hide and offal would probably increase the total percentage to about 75. In other words, the 40 per cent of offal is equivalent in value to about 15 per cent of meat.

In order to effect as close a comparison as possible between the market values at the different cities, a representative high grade of each class of meat has been selected, the aim being to have each class as nearly similar in grade as practicable. The markets represented in the tables are Chicago, New York, London, Berlin, and Paris. The prices quoted are taken from standard trade papers and are shown at monthly periods. The data for the European cities have been converted at the usual rates to the United States equivalents in pounds and cents.

BEEF.

Prices of beef at Chicago were steady for the first half of 1907 and practically the same as they were in 1906, but for the remainder of the year there was a distinct rise, which averaged fully 1 cent a pound. In New York the advance over 1906 was uniform throughout the year. It will be noticed that the price in the last-named city was generally one-half to 1 cent higher than the Chicago figures.

The London meat market is supplied from all quarters of the globe, consequently the various grades are well established and there is generally little fluctuation in the prices. The most interesting thing about the British figures is the significant fact that whereas English beef averaged about 1 cent a pound higher than London-killed American beef in 1906, the two grades ran neck and neck throughout the

[a] F. W. Wilder, in "The Modern Packing House," supplies details of the cost of labor in slaughtering animals at large establishments as follows: Cattle, from 14⅜ to 19 cents a head for killing and dressing. Hogs, cost of killing, 3¾ cents a head; cost of cutting, 3½ cents a head; cost of handling heads, 1½ cents a head. Sheep, cost of killing and dressing, 7⅛ cents a head.

greater part of last year, and toward the close the American product actually rated slightly higher. It should be mentioned that there is one higher grade of beef on the London market than those in the table, namely, Scotch. This averages about 1 cent a pound above English.

Berlin beef prices were quite a little higher in the early part of 1907 than in the corresponding period of 1906, but this condition was exactly reversed in the last four months of the year. It will be noted that the Berlin prices are very much higher than any of the others in the table; they are, generally speaking, 100 per cent above those of Chicago. The prices quoted, however, are for the best beef on the market; there are, besides, three other classes of oxen grading down to about 4 cents a pound less than the first class, and three classes of bulls and five classes of cows and heifers in the regular quotations.

Comparatively little mature beef is consumed in Paris, so the quotations are very meager compared with those of other cities. The Parisians are, however, great veal eaters. No whole carcasses or sides of beef are quoted—only hindquarters and forequarters. The prices therefore show an extreme range. Hindquarters usually rate about 1½ cents a pound above the price for the whole side. With this deduction from Parisian figures it is seen that the best French beef, although somewhat more expensive, is yet reasonably close in price to the London article.

Wholesale prices per pound of fresh carcass beef at home and foreign markets, 1906 and 1907, by months.

Date.[a]	Chicago.	New York.	London.		Berlin.	Paris.
	Good native steers, carcass.	Choice native steers, heavy carcass.	English beef.	American (London killed).	Fat oxen.	Hind quarters.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
January 1907	7-8½	9½	11½–11⅝	10½–11⅝	18 –18½	7 –14
1906	7½–8½	8½	11½–11½	8½–10	15½–16½	8½–14
February 1907	7½–8½	8¾– 9½	10⅝–10¾	10½–11⅜	17 –18	9½–14
1906	7¾–8½	8½	11¼–11½	9½–10¾	15½–16½	8 –12½
March 1907	7½–8½	9 – 9½	11⅛–11⅝	10½–11⅛	16½–17½	8 –13½
1906	7½–8½	8½	11½–11½	9¼–10½	15½–16½	8 –12½
April 1907	7½–8½	9	11½–11⅝	10⅝–11⅝	16½–17½	10½–15¼
1906	7¾–8	8½	11½–11⅜	9¾–10½	15 –16	5½– 8¾
May 1907	8–8½	8½– 9½	10⅞–11⅜	10⅝–11½	16½–17	9½–15¼
1906	7½–8	8½	11½–11⅜	9¾–10⅜	15½–16½	8¾–14
June 1907	8–8½	9	11⅝–11⅞	11⅛–11⅝	16½–16½	9½–15¾
1906	8½	8½	11⅜–12½	11 –12	15½–16½	8½–15
July 1907	8½–9	10	11⅝–12½	11½–12½	16½–17	8½–15
1906	8½–8½	8½	[b] 13⅜–14⅜	9½–10½	16 –16½	8½–15¾
August 1907	8½–9	10¾	11¼–11⅝	10⅝–11⅝	17½–18	8½–15
1906	7½	9	[b] 12⅝–13⅜	10½–11½	17 –18	7 –13½
September 1907	9½	11	11⅝–11⅞	11⅛–12⅝	17¾–18½	8¾–13¼
1906	7½–8	9 – 9½	[b] 13¾–14½	10½–11½	19 –19¾	7 –14
October 1907	9¾	10½–10¾	10½–11½	10⅝–11⅝	17½–18	9½–15
1906	7½–8½	9¾	[b] 12½–13¾	9½–11	18½–19	5½–11½
November 1907	9¾	10¾–11	10⅝–11½	10½–11⅜	17 –17¾	8 –14
1906	7½–8½	9 –10	12½–12¾	11 –12½	18½–19½	5½–13½
December 1907	9½	10½–10¾	10⅝–11¼	10⅝–11⅜	17 –17¾	8 –13¾
1906	7¼–8½	9 – 9¾	11¾–12¼	9¾–11¼	18½–19	7 –14

[a] The prices for Berlin and Paris are for the first Saturday in each month; those for London are for the preceding Friday; those of New York for the preceding Thursday, and those of Chicago for the preceding Tuesday. No closer uniformity could be secured with the trade papers quoted from.

[b] This price is for "short sides," long sides not being quoted. The price for short sides averages about 1 cent higher than that for long sides.

VEAL.

The class of veal rated as "Prime" on the New York market averages about 3 cents a pound in excess of the best grade quoted at Chicago. Except for the first two months of the year the prices were uniformly a little higher in 1907 than they were the year before. The table shows that London veal in 1906 was quoted below New York on only two occasions—August and October. In 1907, however, it is of interest to note that up to and including July London prices were generally 1 to 2 cents a pound above New York, but for the remaining months the British figures were always slightly lower than the American.

The Berlin prices are again considerably the highest on the list, but their best veal is probably a very choice article. The total quantity of veal marketed at the German capital is quite inconsiderable. The Parisians, on the other hand, as previously stated, consume very large quantities. It is a surprising fact that the quantity of veal consumed in Paris is about equal to that of all other classes of meat combined. The best French veal runs from 1 to 3 cents a pound below the Berlin figures, and is from 2 to 6 cents a pound higher than London.

Wholesale prices per pound of fresh carcass veal at home and foreign markets, 1906 and 1907, by months.

Date.[a]		Chicago.	New York.	London.	Berlin.	Paris.[b]
		Good carcass.	Prime veal.	Best veal.	Choice whole-milk fed.	Choice.
		Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*
January	1907	10 -11	14	15½–16¼	22½–23½	19¼–20¾
	1906	10½–11	14–14½	16¾–18¼	20 –21½	15 –15½
February	1907	11½–12	14½	13¾–14⅝	19¼–20	17½–19¼
	1906	10½–11	14–14½	16¼–17½	18¾–19½	14 –15¾
March	1907	11½–12	14½	13⅝–15½	19 –20	16¾–17½
	1906	10½–11	14–14½	15½–16½	19½–20	15 –16½
April	1907	11 –11½	14	14½–15¾	20¼–21½	16¾–18¾
	1906	10 –10½	13	13¾–14½	19 –19¾	13½–14½
May	1907	10 –11	12	13⅝–14⅝	20¼–21½	19 –20¼
	1906	9 – 9½	10½	13¼–14¼	18¾–19¾	13½–15
June	1907	9 –10	13	14⅜–15½	20¼–21	17½–18½
	1906	10	11	13¾–14¾	20¼–21½	14½–15½
July	1907	9 –10	13	13⅜–14¼	16¾–17¾	15 –16¾
	1906	10½	11½	13¾–14¾	19¼–20¼	12¾–13¾
August	1907	10 –11	13–14	12⅜–13⅜	18 –18¾	15 –15¾
	1906	9½	13	10¾–12¼	17½–19¼	11½–12¾
September	1907	10 –11	13–14	12⅜–13⅜	18¾–19½	16½–17½
	1906	10½–11	13½	13¼–14½	19¾–20¾	12¾–13½
October	1907	11 –12	14–15	13¼–14¼	19 –19¾	18½–19¾
	1906	10 –11½	14½	12¾–14½	20¼–21½	11½–12¾
November	1907	12	14–14½	13¼–14⅜	20¼–21¾	19¾–20¾
	1906	10 –10½	14	13⅜–15¼	20¾–21½	16½–17½
December	1907	12	14–14½	13⅜–14⅜	20¼–21¾	18¾–20¼
	1906	10	14	15¼–16¼	20¼–22	16½–18

[a] See footnote (a) under beef table.
[b] The Paris prices for 1906 are not comparable with those of 1907, as they are for a lower grade.

MUTTON.

A good mutton carcass will bring on an average about 1 cent a pound more than a good beef carcass in the United States, although the quantity consumed is relatively much smaller. The same is true in regard to London and Paris, except that the difference is still more marked. Berlin affords the only exception to the rule, the contrary being generally the case there, but in many instances it will be seen by the table that the values of the best mutton and beef are in close accord.

On comparing 1907 with 1906 it appears that mutton values were generally higher in the United States during the latter year. In London, however, the conditions were just the reverse, the decrease in many cases being fully 2 cents a pound. There was no appreciable change in the Berlin prices, but the Paris quotations show a pronounced rise throughout the year.

Wholesale prices per pound of fresh carcass mutton at home and foreign markets, 1906 and 1907, by months.

Date.[a]	Chicago.	New York.	London.	Berlin.	Paris.
	Good sheep.	Choice sheep.	English.	Fat wethers.	First quality.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*
January 1907	9	10	12⅝–13⅝	15¼–16	16¼–18
1906	9½–10	9½	13¼–14¼	15½–16¼	15 –16¾
February 1907	9	9	12⅛–13⅜	15½–16½	17½–18½
1906	9½–10	9½	13½–15¼	15¾–16¼	15½–17
March 1907	9	9	12⅝–14¼	15¾–16½	17½–18½
1906	9½–10	9	13¼–14⅜	15¼–16¾	16½–17½
April 1907	9	10	13⅜–14⅝	15 –15¾	18½–19¼
1906	9½–10	9	14¼–15½	14¾–15	16½–17½
May 1907	10	11	13⅜–15½	15 –16	19 –19¾
1906	9½–10	11	14¼–17¾	14¾–15	15¾–17
June 1907	10	12½	14⅜–16¼	15 –16	17½–19
1906	9	11	17¼–18¾	16 –16¾	15¾–17½
July 1907	11	10	14⅜–15¾	16 –16¾	17½–18½
1906	9½–11	10½–11	16¾–18½	15½–16½	15 –16¼
August 1907	10	10½	13⅛–15¾	17¼–18½	17½–19
1906	9	9 –10	16¼–17½	17 –17¾	15½–16½
September 1907	9 – 9½	11	12⅝–14⅝	17¼–18¼	16¾–17½
1906	9 –10	10 –10½	15¼–16¼	17¼–18	11½–16¼
October 1907	10	11	13⅜–14⅝	16½–16¾	18½–19¼
1906	9 –10	10	15¼–16½	16¾–17½	14 –15
November 1907	10	11	12⅝–14⅝	15¼–16	17½–19¼
1906	9	10	14¾–15¾	16¾–17½	15¾–16½
December 1907	10½	10½	12⅝–14⅝	15½–16½	17½–19¼
1906	9	10	14¾–15¼	16½–17¼	15¾–17½

[a] See footnote (a) under beef table.

LAMB.

Excepting the spring months—April, May, and June—lamb frequently sold at a higher rate at Chicago than at New York. Prices ruled about the same in 1907 as in the preceding year. The new season's lamb on the London market is a very choice article and is much sought after by those who can afford the high prices. With a few exceptions the best lamb at Paris brought a higher price than the similar product at Berlin.

Wholesale prices per pound of fresh carcass lamb at home and foreign markets, 1906 and 1907, by months.

Date.[a]	Chicago. Round dressed lambs.	New York. Choice spring lambs.	London. Choice native.	Berlin. Fat lambs.	Paris.[b] Choice (without head and pluck).
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*
January 1907	12 -13	12 -13	.....	16½-17½	15 -19½
1906	12 -12½	13	.....	16¾-17¾	9½-15¾
February 1907	12 -13	12 -12½	.....	16¾-17¾	14 -18½
1906	12½	12	.....	16¾-17½	9½-15¾
March 1907	12 -13	12	20¼-23¼	16¾-17¾	14 -18½
1906	11½-12	11½	21¼-24½	16½-17½	12½-15½
April 1907	12 -13	14	19½-22½	16 -16¾	14 -19½
1906	11 -11½	11	19½-22½	15¾-16½	10½-16½
May 1907	13 -13½	14½	19½-22½	16½-17	14 -19¾
1906	11 -11½	12 -12½	18½-21½	15¾-16½	8¾-15¾
June 1907	13½-14	16	18½-20½	16½-17	14 -19½
1906	11½-12½	15 -16	17½-20½	17½-17¾	8¾-16½
July 1907	13	13	16½-19½	17½-18	15 -18½
1906	13 -14½	15	16½-19½	17 -17½	8¾-15¾
August 1907	13	12½	15½-18½	18¾-19½	14 -19
1906	12½	12½	15½-18½	18½-18¾	8¾-15¾
September 1907	13	13½	14⅝-15¾	19 -19½	14 -18½
1906	13 -14	14	15½-17½	18½-19	10½-15
October 1907	13½	13½	14⅝-15½	18½-18¾	15¾-20¼
1906	13 -14	14	15½-16¾	18 -18½	7 -15
November 1907	13½	12½	14⅝-15¼	18 -18¼	15 -22
1906	13	13	14½-15¾	18¼-19	15 -16½
December 1907	13½	12	[c] 20¼-22½	18 -18¾	15¾-22
1906	12 -13	12½-13	.....	18¼-18¾	10½-11½

[a] See footnote (a) under beef table.
[b] The Paris prices for 1906 are not comparable with those of 1907 as they are for a lower grade of lamb.
[c] Fall lamb.

PORK.

The price of dressed hogs at Chicago was exceedingly steady and stood at a very high level throughout the year 1907. A reference to the table following will show that the period of high prices commenced in August, 1906, and continued thereafter without a break. The prices in 1906 prior to August were considerably lower—as much as 2 cents a pound in January and February. New York prices in 1907 were, on the whole, a shade below those of Chicago, while in December there was a decided fall. Apparently this was a proper reflection of the live-stock market, which in November and December was in a very depressed state. This condition does not appear, however, in Chicago quotations for that period.

Best London pork carcasses averaged over 3 cents a pound higher than American. Values were steady and for the latter part of the year somewhat lower than in 1906. Berlin prices were surprisingly low for the first part of 1907. During the first six months of the year they ran no less than 3 to 4 cents a pound below the figures of 1906. They were also considerably below the London prices for the same period. There was some increase later in the year, but only in August and September did they exceed the British figures. Prices were again low for the last three months of the year, when they averaged about 2 cents lower than 1906. Paris pork was from 2 to

3 cents higher than London throughout 1907, and fully 4 cents above the Berlin figures. This would make it about 70 per cent higher than Chicago and New York. It should be stated, however, that the European pork is carefully graded, and the classes in the table no doubt represent a picked product of high quality.

Wholesale prices per pound of fresh carcass pork at home and foreign markets, 1906 and 1907, by months.

Date.[a]		Chicago.	New York.	London.	Berlin.	Paris.[b]
		Dressed hogs.	Dressed hogs.	Best (small and medium).	Choice (medium weight).	Choice.
		Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*
January	1907	9½–9¾	9¼	12⅜–13⅜	13½	14½–15½
	1906	7 –7½	7⅞–7½	12½–13½	16¼	11½–12½
February	1907	9¼–9⅜	9½–9¾	12¼–13¼	12¾	14½–15⅜
	1906	7 –7½	7¾	13⅜–14⅜	16⅜	11½–12⅜
March	1907	9½–9¾	9¼–9⅞	13¼–14⅜	11¾	15 –16¼
	1906	7½–8½	8⅜–8½	13¾–14⅜	16½	12¾–13½
April	1907	9¼–9½	8¾–9¼	13⅜–14⅜	11½	15½–16¼
	1906	7½–8½	8¾–8⅞	13¾–15½	15½	12⅜–13¼
May	1907	9½–9¾	8¾–9⅜	13¼–14⅜	10½	16½–17½
	1906	7½–8½	9	13½–14½	13½	13½–14½
June	1907	9¼–9¾	8½–9	11⅝–12⅜	10¾	16¾–17½
	1906	8½–8¾	8⅞	13½–14¼	13½	13½–14¾
July	1907	9½–9¾	8⅜–8⅞	11⅝–12⅜	12	16½–17
	1906	9 –9¼	9⅛	12½–13½	14½	13½–14½
August	1907	9½–9¾	8⅜–9½	11⅝–12⅜	14½	15½–16¾
	1906	9½–9¾	9½	12½–13½	15	12⅜–13¾
September	1907	9½–9⅝	8⅞–9⅜	12½–13⅜	13⅜	16½–16¾
	1906	9¾–9¾	8⅞	13½–14½	15½	12¼–13¼
October	1907	9½–9¾	8⅞–9¼	12⅜–13⅜	13	15 –15¾
	1906	9½–9¾	9½–9⅝	14½–15½	15¼	11½–12½
November	1907	9½–9¾	8⅜–9½	12⅜–13⅜	12	15 –15¾
	1906	9½–9¾	8⅞	13½–14¾	14½	12½–13½
December	1907	9½–9¾	6⅞–7⅜	11¼–12¼	12	15 –16½
	1906	9½–9¾	9⅛	13¼–14¾	13½	12½–13¼

[a] See footnote (a) under beef table.
[b] The Paris prices for 1906 are not comparable with those of 1907 as they are for a lower grade.

REGISTERED LIVE STOCK IN THE UNITED STATES.

The annexed statements show the latest information regarding purebred registered live stock in the United States. The details, including the estimates of the number of registered animals now living in each case, have been furnished by the secretaries of the pedigree record associations, to whom acknowledgment is made for the courtesy.

With these figures as a basis it is possible to obtain an approximate idea of the proportion of living registered animals in each class to the total number of that class in the country. This matter was gone into at some length by the Animal Husbandman of the Bureau in the Twenty-second Annual Report, pages 294 and 295. The figures there given, which would apply without appreciable change to present conditions, show that a shade over 1 per cent of our horses, dairy cattle, and beef cattle are registered, while about one-half of 1 per cent of the sheep and hogs are similarly recorded.

Registered live stock in the United States on June 30, 1907.

[Compiled from estimates and statements furnished by secretaries of certified pedigree record associations.]

Breed.	Animals registered.			Animals living.		
	Male.	Female.	Total.	Male.	Female.	Total.
HORSES.						
American Trotter	46,170	159,845	206,015	25,000	50,000	75,000
Belgian Draft	2,740	395	3,135	2,800	425	3,225
Cleveland Bay	1,262	520	1,782	1,200	450	1,650
Clydesdale	.....	.....	13,181	.....	.....	13,236
French Draft	10,071	5,942	16,013	6,000	5,500	11,500
French Coach:						
French Coach Studbook of America	2,221	725	2,946	1,500	500	2,000
French Coach Horse Register	276	6	282	268	6	274
German Coach	2,149	290	2,439	1,900	250	2,150
Oldenburg Coach	275	23	298	240	25	265
Hackney	924	1,761	2,685	622	1,176	1,798
Morgan	.....	.....	.....	2,000	2,000	4,000
Percheron:						
Percheron Studbook of America	5,022	4,614	9,636	21,500	14,000	35,500
Percheron Register	1,787	413	2,200	1,762	393	2,155
American Breeders and Importers' Percheron Registry	1,130	889	2,019	21,000	13,000	34,000
Saddle Horse	2,890	4,126	7,016	2,166	3,096	5,262
Shetland Pony	2,500	3,800	6,300	3,000	3,500	6,500
Shire	2,890	3,834	6,724	2,375	625	3,000
Suffolk	194	128	322	120	100	220
Thoroughbred	.....	.....	47,646	.....	.....	25,000
ASSES.						
Jacks and jennets	1,436	900	2,336	.....	.....	.....
CATTLE.						
Aberdeen-Angus	46,372	59,020	105,392	31,757	40,419	72,176
Ayrshire	10,310	22,095	32,405	1,286	7,020	8,306
Devon	8,281	14,291	22,572	4,000	10,000	14,000
Dutch Belted	649	1,385	2,034	175	500	675
Galloway	17,946	12,754	20,700	7,000	10,100	17,100
Guernsey	12,174	22,678	34,852	8,000	14,000	22,000
Hereford	.....	.....	268,383	.....	.....	115,000
Holstein-Friesian	50,872	104,846	155,718	(a)	(a)	b 65,000
Jersey	76,817	207,453	284,270	(a)	(a)	b 125,000
Polled Durham	6,615	7,957	14,572	4,505	5,631	10,136
Red Polled	16,366	27,148	43,514	6,500	13,500	20,000
Shorthorn	282,100	432,903	715,003	93,000	186,000	279,000
Sussex	85	188	273	68	108	176
Brown Swiss	2,424	3,572	5,996	(a)	(a)	b 2,500
SHEEP.						
Cheviot	.....	.....	11,410	625	3,150	3,775
Cotswold	.....	.....	43,790	.....	.....	16,000
Dorset Horn	1,815	4,711	6,526	1,200	3,000	4,200
Hampshire Down	6,540	14,694	21,234	2,500	8,000	10,500
Leicester	4,068	6,344	10,412	3,417	5,328	8,745
Lincoln	6,660	9,550	16,210	4,800	6,800	11,600
Merino (Delaine):						
Dickinson Spanish Merino Sheep Register	.....	.....	10,494	.....	.....	8,000
Improved Delaine Merino Register	8,700	15,800	23,800	3,000	10,000	13,000
National Delaine Merino Register	6,973	11,893	18,866	500	2,000	2,500
Merino (French)	.....	.....	41,975	15,000	25,000	40,000
Merino (German)	197	256	453	158	194	352
Merino (Spanish):						
Register of the Michigan Merino Sheep Breeders' Association	12,575	37,775	50,350	1,000	5,000	6,000
Register of the New York State American Merino Sheep Breeders' Association	7,960	11,957	19,917	90	630	720
Register of the Ohio Spanish Merino Sheep Breeders' Association	17,496	34,715	52,211	3,200	7,986	11,168
Register of the Standard American Merino Sheep Breeders' Association	1,275	1,500	2,775	60	240	300
Register of the Vermont Merino Sheep Breeders' Association	.....	.....	218,265	.....	.....	5,000

a No data. b Estimated.

Registered live stock in the United States on June 30, 1907—Continued.

Breed.	Animals registered.			Animals living.		
	Male.	Female.	Total.	Male.	Female.	Total.
SHEEP—Continued.						
Oxford Down	16,644	25,121	41,765	.....	.....	15,000
Shropshire	112,000	154,000	266,000	50,000	90,000	140,000
Southdown	.....	.....	21,742	.....	.....	10,000
Suffolk	.....	.....	1,133	300	330	630
HOGS.						
Berkshire	.....	.....	102,040	.....	.....	50,000
Cheshire	1,291	2,728	4,019	300	1,000	1,300
Chester, Ohio Improved	.....	.....	18,203	2,600	7,400	10,000
Duroc-Jersey:						
American Duroc-Jersey Record	10,183	23,530	33,713	9,000	18,430	27,430
National Duroc-Jersey Record	32,000	77,500	109,500	25,000	75,000	100,000
Hampshire (thin rind)	645	1,783	2,428	440	1,690	2,130
Poland-China:						
American Poland-China Record	63,269	156,955	220,224	16,000	40,000	56,000
National Poland-China Record	35,000	78,000	113,000	35,000	65,000	100,000
Southwestern Poland-China Record	895	1,316	2,211	400	700	1,100
Standard Poland-China Record	45,678	110,060	155,738	3,000	12,000	15,000
Tamworth	971	2,914	3,885	500	2,500	3,000
Yorkshire	.....	.....	9,371	1,200	3,000	4,200

CERTIFIED PEDIGREE RECORD ASSOCIATIONS.

Paragraph 473 of the tariff act of July 24, 1897 (amended March 3, 1903), provides that—

Any animal imported by a citizen of the United States specially for breeding purposes shall be admitted free, whether intended to be so used by the importer himself or for sale for such purpose: *Provided*, That no such animal shall be admitted free unless purebred of a recognized breed, and duly registered in the books of record established for that breed: *And provided further*, That certificate of such record and of the pedigree of such animal shall be produced and submitted to the customs officer, duly authenticated by the proper custodian of such book of record, together with the affidavit of the owner, agent, or importer that such animal is the identical animal described in said certificate of record and pedigree: *And provided further*, That the Secretary of Agriculture shall determine and certify to the Secretary of the Treasury what are recognized breeds and purebred animals under the provisions of this paragraph.

Accordingly the Secretary of Agriculture has certified a large number of books of record of pedigrees and their publishing agencies and has prescribed regulations for them, which have been published in Bureau of Animal Industry Order 136. A list of the certified American records and associations follows.

CATTLE.

Name of breed.	Book of record.	By whom published.
Aberdeen-Angus	American Aberdeen-Angus Herdbook	American Aberdeen-Angus Breeders' Association, Charles Gray, secretary, Union Stock Yards, Chicago, Ill.
Ayrshire	Ayrshire Record	Ayrshire Breeders' Association, C. M. Winslow, secretary, Brandon, Vt.
Brown Swiss	Swiss Record	Brown Swiss Cattle Breeders' Association, C. D. Nixon, secretary, Owego, N. Y.
Devon	American Devon Record	American Devon Cattle Club, L. P. Sisson, secretary, Newark, Ohio.
Dutch Belted	Dutch Belted Cattle Herdbook	Dutch Belted Cattle Association of America, H. B. Richards, secretary, Easton, Pa.
Galloway	American Galloway Herdbook	American Galloway Breeders' Association, Robert W. Brown, secretary, Union Stock Yards, Chicago, Ill.
Guernsey	Herd Register of the American Guernsey Cattle Club.	American Guernsey Cattle Club, William H. Caldwell, secretary, Peterboro, N. H.
Hereford	American Hereford Record	American Hereford Cattle Breeders' Association, C. R. Thomas, secretary, 225 West Twelfth street, Kansas City, Mo.
Holstein	Holstein-Friesian Herdbook	Holstein-Friesian Association of America, Frederick L. Houghton, secretary, Brattleboro, Vt.
Jersey	Herd Register of the American Jersey Cattle Club.	American Jersey Cattle Club, J. J. Hemingway, secretary, 8 West Seventeenth street, New York, N. Y.
Polled Durham	American Polled Durham Herdbook	Polled Durham Breeders' Association, J. H. Martz, secretary, Greenville, Ohio.
Red Polled	Red Polled Herdbook	Red Polled Cattle Club of America (Incorporated), H. A. Martin, secretary, Gotham, Wis.
Shorthorn	American Shorthorn Herdbook	American Shorthorn Breeders' Association, John W. Groves, secretary, Union Stock Yards, Chicago, Ill.
Sussex	American Sussex Register	American Sussex Association, Overton Lea, secretary, Nashville, Tenn.

HORSES.

American Trotter	American Trotting Register	American Trotting Register Association, Wm. H. Knight, secretary, 355 Dearborn street, Chicago, Ill.
Belgian Draft	American Register of Belgian Draft Horses	American Association of Importers and Breeders of Belgian Draft Horses, J. D. Conner, jr., secretary, Wabash, Ind.
Cleveland Bay	American Cleveland Bay Studbook	Cleveland Bay Society of America, R. P. Stericker, secretary, 80 Chestnut avenue, West Orange, N. J.
Clydesdale	American Clydesdale Studbook	American Clydesdale Association, R. B. Ogilvie, secretary, Union Stock Yards, Chicago, Ill.
French Coach	French Coach Studbook	French Coach Horse Society of America, Duncan E. Willett, secretary, 2112 Michigan avenue, Chicago, Ill.
Do	French Coach Horse Register	French Coach Horse Registry Company, Chas. C. Glenn, secretary, 1319 Wesley avenue, Columbus, Ohio.
French Draft	National Register of French Draft Horses	National French Draft Horse Association of America, C. E. Stubbs, secretary, Fairfield, Iowa.
German Coach	German, Hanoverian, and Oldenburg Coach Horse Studbook.	German, Hanoverian, and Oldenburg Coach Horse Association of America, J. Crouch, secretary, Lafayette, Ind.
Hackney	American Hackney Studbook	American Hackney Horse Society, Gurney C. Gue, secretary, Tichenor-Grand Bldg., Broadway and Sixty-first street, New York, N. Y.
Morgan	American Morgan Register	American Morgan Register Association, T. E. Boyce, secretary, Middlebury, Vt.
Oldenburg	Oldenburg Coach Horse Register	Oldenburg Coach Horse Association of America, C. E. Stubbs, secretary, Fairfield, Iowa.

Percheron	Percheron Studbook of America	Percheron Society of America, Geo. W. Stubblefield, secretary, Union Stock Yards, Chicago, Ill.
Do	Percheron Register	The Percheon Registry Company, Chas. C. Glenn, secretary, 1319 Wesley avenue, Columbus, Ohio.
Do	The American Breeders' and Importers' Percheron Register.	The American Breeders' and Importers' Percheron Registry Company, John A. Forney, secretary, Plainfield, Ohio.
Saddle Horse	American Saddle Horse Register	American Saddle Horse Breeders' Association, I. B. Nall, secretary, Louisville, Ky.
Shetland Pony	American Shetland Pony Club Studbook	American Shetland Pony Club, Mortimer Levering, secretary, Lafayette, Ind.
Shire	American Shire Horse Studbook	American Shire Horse Association, Charles Burgess, sr., secretary, Wenona, Ill.
Suffolk	American Suffolk Horse Studbook	American Suffolk Horse Association, Alex. Galbraith, secretary, Janesville, Wis.
Thoroughbred	American Studbook	The Jockey Club, W. H. Rowe, registrar, 571 Fifth avenue, New York, N. Y.
Welch Ponies and Cobs	Welch Pony and Cob Studbook	Welch Pony and Cob Society of America, John Alexander, secretary, Aurora, Ill.

ASSES.

Jacks and jennets	American Jack Stock Studbook	American Breeders' Association of Jacks and Jennets, J. W. Jones, secretary, Columbia, Tenn.

SHEEP.

Cheviot	American Cheviot Sheep Flock Book	American Cheviot Sheep Society, F. E. Dawley, secretary, Fayetteville, N. Y.
Cotswold	American Cotswold Record	American Cotswold Registry Association, F. W. Harding, secretary, Waukesha, Wis.
Dorset Horn	Continental Dorset Club Record	The Continental Dorset Club, Joseph E. Wing, secretary, Mechanicsburg, Ohio.
Hampshire Down	Hampshire Down Flock Record	Hampshire Down Breeders' Association of America, Comfort A. Tyler, secretary, Nottawa, Mich.
Leicester	American Leicester Record	American Leicester Breeders' Association, A. J. Temple, secretary, Cameron, Ill.
Lincoln	National Lincoln Sheep Breeders' Record	National Lincoln Sheep Breeders' Association, Bert Smith, secretary, Charlotte, Mich.
Merino (Delaine)	Dickinson Spanish Merino Sheep Register	Dickinson Merino Sheep Record Company, Beulah McDowell, secretary, Canton, Ohio.
Do	National Delaine Merino Register	National Delaine Merino Sheep Breeders' Association, J. B. Johnson, secretary, 248 West Pike street, Canonsburg, Pa.
Merino (French)	American Rambouillet Record	American Rambouillet Sheep Breeders' Association, Dwight Lincoln, secretary, Milford Center, Ohio.
Merino (German)	International Von Homeyer Rambouillet Club Record.	International Von Homeyer Rambouillet Club, E. N. Ball, secretary, Ann Arbor, Mich.
Merino (Spanish)	Register of the Michigan Merino Sheep Breeders' Association.	Michigan Merino Sheep Breeders' Association, E. N. Ball, secretary, Ann Arbor, Mich.
Do	Register of the New York State American Merino Sheep Breeders' Association.	New York State American Merino Sheep Breeders' Association, J. H. Earll, secretary, Skaneateles, N. Y.
Do	Register of the Ohio Merino Sheep Breeders' Association.	Ohio Merino Sheep Breeders' Association, Wesley Bishop, secretary, R. F. D. 1, Delaware, Ohio.
Do	Register of the Standard American Merino Sheep Breeders' Association.	Standard American Merino Sheep Breeders' Association, J. P. Ray, secretary, R. F. D. 3, East Bloomfield, N.Y.
Do	Register of the Vermont Merino Sheep Breeders' Association.	Vermont Merino Sheep Breeders' Association, C. A. Chapman, secretary, Middlebury, Vt.
Oxford Down	American Oxford Down Record	American Oxford Down Record Association, W. A. Shafor, secretary, Hamilton, Ohio.
Shropshire	American Shropshire Sheep Record	American Shropshire Registry Association, Mortimer Levering, secretary, Lafayette, Ind.
Southdown	American Southdown Record	American Southdown Breeders' Association, Frank S. Springer, secretary, 510 East Monroe street, Springfield, Ill.
Suffolk	American Suffolk Flock Record	American Suffolk Flock Registry Association, Geo. W. Franklin, secretary, Des Moines, Iowa.

HOGS.

Name of breed.	Book of record.	By whom published.
Berkshire	American Berkshire Record	American Berkshire Association, Frank S. Springer, secretary, 510 East Monroe street, Springfield, Ill.
Cheshire	Cheshire Herdbook	Cheshire Swine Breeders' Association, Ed. S. Hill, secretary, Freeville, N. Y.
Chester, Ohio Improved	O. I. C. Record	O. I. C. Swine Breeders' Association, J. C. Hiles, secretary, Cleveland, Ohio.
Duroc-Jersey	American Duroc-Jersey Record	American Duroc-Jersey Swine Breeders' Association, T. B. Pearson, secretary, Thorntown, Ind.
Do	National Duroc-Jersey Record	National Duroc-Jersey Record Association, H. C. Sheldon, secretary, Peoria, Ill.
Hampshire (Thin Rind)	American Hampshire Record	American Hampshire Swine Record Association, E. C. Stone, secretary, Armstrong, Ill.
Poland-China	American Poland-China Record	American Poland-China Record Association, W. M. McFadden, secretary, Union Stock Yards, Chicago, Ill.
Do	National Poland-China Record	National Poland-China Record Company, A. M. Brown, secretary, Drawer 16, Winchester, Ind.
Do	Southwestern Poland-China Record	Southwestern Poland-China Record Association, H. P. Wilson, secretary, Gadsden, Tenn.
Do	Standard Poland-China Record	Standard Poland-China Record Association, Geo. F. Woodworth, secretary, Maryville, Mo.
Tamworth	American Tamworth Swine Record	American Tamworth Swine Record Association, E. N. Ball, secretary, Ann Arbor, Mich.
Yorkshire	American Yorkshire Record	American Yorkshire Club, Harry G. Krum, secretary, Whitebear Lake, Minn.

DOGS.

Fifty-seven recognized breeds.	American Kennel Club Studbook	American Kennel Club, A. P. Vredenburgh, secretary, 55 Liberty street, New York, N. Y.

CATS.

Long-haired (Angora or Persian), short-haired (Siamese, Manx, Mexican, Abyssinian, Indian, Russian, and Japanese).	United States Register and Studbook (except appendix).	United States Official Register Association (Incorporated), Mrs. S. Hazen Bond, registrar, 310 First street SE., Washington, D. C.
Long-haired (Persian or Angora). Short-haired (Russian, Siamese, Japanese, Mexican, Manx, Abyssinian, Native).	Studbook of the American Cat Association	American Cat Association, Mrs. Anna L. Besse, secretary-treasurer, 5534 Union ave., Chicago, Ill.

NATIONAL AND STATE STOCK BREEDERS' ASSOCIATIONS.

Name of organization.	Secretary.	Address.
American Association of Live Stock Herd Book Secretaries.	Charles F. Mills	Springfield, Ill.
American National Live Stock Association	W. M. Tomlinson	Denver, Colo.
American Trotting Association	W. H. Knight	Chicago, Ill.
National Trotting Association	W. H. Gocher	Hartford, Conn.
National Wool Growers' Association	George S. Walker	Cheyenne, Wyo.
The Corn Belt Meat-Producers' Association	H. C. Wallace	Des Moines, Iowa.
Alabama Live Stock Association	D. T. Gray	Auburn, Ala.
California Live Stock Breeders' Association	E. W. Major	Berkeley, Cal.
Colorado Cattle and Horse Growers' Association.	F. P. Johnson	P. O. Box 1507, Denver, Colo.
Connecticut Sheep Breeders' Association	Burton C. Patterson	Torrington, Conn.
Southeastern Stock Growers' Association	Z. C. Chambliss	Ocala, Fla.
Georgia Dairy and Live Stock Association	C. L. Willoughby	Experiment, Ga.
Hawaiian Live Stock Breeders' Association	Albert F. Judd	Honolulu, Hawaii.
Idaho Wool Growers' Association	J. C. Clinton, jr	Boise, Idaho.
Illinois Live Stock Breeders' Association	O. H. Swigart	Farmer City, Ill.
Indiana Live Stock Breeders' Association	J. H. Skinner	Lafayette, Ind.
Indiana Swine Breeders' Association	Chas. S. Hemenway	Zionsville, Ind.
Indiana Wool Growers' Association	H. H. Keim	Ladoga, Ind.
Iowa Improved Stock Breeders' Association	W. J. Kennedy	Ames, Iowa.
Iowa Swine Breeders' Association	C. C. Carlin	3403 Fifth street, Des Moines, Iowa.
Interstate Breeders' Association	F. L. Wirick	Sioux City, Iowa.
Kansas Improved Stock Breeders' Association	H. A. Heath	Topeka, Kans.
Kansas Swine Breeders' Association	I. D. Graham	Do.
Kentucky Beef Cattle Breeders' Association	J. J. Hooper	Lexington, Ky.
Kentucky Live Stock Breeders' Association	Clarence Sale	23 Board of Trade Building, Louisville, Ky.
Kentucky Swine Breeders' Association	M. W. Neal	514 Third street, Louisville, Ky.
Louisiana Stock Breeders' Association	W. H. Dalrymple	Baton Rouge, La.
Eastern Horse Breeders' Association	J. E. Osborne	Calais, Me.
Massachusetts Cattle Owners' Association	J. L. Harrington	Lunenburg, Mass.
Michigan Improved Live Stock Breeders' Association.	A. C. Anderson	Agricultural College, Mich.
Minnesota Horse Breeders' Association	G. W. Patterson	Worthington, Minn.
Minnesota Live Stock Breeders' Association	Andrew Boss	St. Anthony Park, St. Paul, Minn.
Minnesota Sheep Breeders' Association	C. W. Glotfelter	Waterville, Minn.
Minnesota Swine Breeders' Association	D. A. Gaumnitz	St. Anthony Park, St. Paul, Minn.
Southern Live Stock Association	J. M. Aldrich	Michigan City, Miss.
Improved Live Stock Breeders' Association	Geo. B. Ellis	Columbia, Mo.
Missouri State Sheep Breeders' Association	M. V. Carroll	Sedalia, Mo.
Central Montana Wool Growers' Association	A. C. Logan	Billings, Mont.
Montana Registered Cattle Breeders' Association.	John W. Pace	Helena, Mont.
Montana Stock Growers' Association	H. R. Wells	Miles City, Mont.
North Montana Roundup Association	T. A. Cummings	Fort Benton, Mont.
Nebraska Improved Live Stock Breeders' Association.	R. H. Searle	Edgar, Nebr.
Nebraska Stock Growers' Association	E. M. Searle, jr	State Capitol, Lincoln, Nebr.
Nebraska State Swine Breeders' Association	W. G. Unitt	Seward, Nebr.
Cattle Growers' Association of New Mexico	W. C. Barnes	Las Vegas, N. Mex.
New Mexico Wool Growers' Association	H. F. Lee	Albuquerque, N. Mex.
Cattle and Horse Protective Association of Central New Mexico.	J. W. Medley	Magdalena, N. Mex.
Northeastern New Mexico Stock Growers' Association.	L. F. Wilson	Folsom, N. Mex.
New York State Sheep Breeders' Association	W. W. Smallwood	Warsaw, N. Y.
New York State Breeders' Association	Albert E. Brown	Batavia, N. Y.
North Dakota Live Stock Association	W. B. Richards	Agricultural College, N. Dak.
Ohio Horse Breeders' Association	Samuel Taylor	Grove City, Ohio.
Ohio Live Stock Association	C. S. Plumb	Columbus, Ohio.
Ohio Swine Breeders' Association	Ernst Freigau	Do.
Oklahoma Improved Breeders' Association	J. A. Spaulding	Pondcreek, Okla.
Oklahoma Live Stock Association	W. E. Bolton	Woodward, Okla.
Oregon Live Stock Breeders' Association	M. D. Wisdom	Portland, Oreg.
Pennsylvania Live Stock Breeders' Association.	E. S. Bayard	East End, Pittsburg, Pa.
South Carolina Live Stock Association	Lewis A. Klein	Clemson College, S. C.
Missouri River Stockmens' Association	John Hayes	Fort Pierre, S. Dak.
North Western Stock Growers' Association	A. W. Sellers	Bellefourche, S. Dak.
South Dakota Improved Live Stock and Poultry Breeders' Association.	James W. Wilson	Brookings, S. Dak.
Western South Dakota Stock Growers' Association.	F. M. Stewart	Buffalo Gap, S. Dak.
Tennessee Live Stock Breeders' Association	May Overton	42 Arcade, Nashville, Tenn.
Cattle Raisers' Association of Texas	H. E. Crowley	Fort Worth, Tex.
Texas Sheep and Goat Breeders' Association	R. A. Bradford	Taylor, Tex.
Texas Swine Breeders' Association	M. M. Offut	Cleburne, Tex.

Name of organization.	Secretary.	Address.
Utah Cattle Growers' Association	Wesley K. Walton	Woodruff, Utah.
Utah Cattlemen's Association	J. Wesley Walton	Salt Lake City, Utah.
Mount Pleasant Wool Growers' Association	Fred C. Jensen	Mount Pleasant, Utah.
Utah Wool Growers' Association	Henry Moss	443 Constitution Building, Salt Lake City, Utah.
Inland Stock Breeders' Association	W. A. Linklater	Pullman, Wash.
Washington Live Stock Association	F. M. Rothrock	E. 917 Augusta avenue, Spokane, Wash.
West Virginia Live Stock Association	C. E. Lewis	Savannah, W. Va.
West Virginia Sheep Breeders' Association	J. B. Huyett	Charlestown, W. Va.
Wisconsin Live Stock Breeders' Association	F. H. Scribner	Rosendale, Wis.
Wisconsin Sheep Breeders' Association	William F. Renk	Sun Prairie, Wis.
Snake River Live Stock Association	Harry L. Hays	Dixon, Wyo.
Wyoming Stock Growers' Association	Miss Alice R. Smith	Cheyenne, Wyo.
Wyoming Wool Growers' Association	George S. Walker	Do.

POULTRY SPECIALTY CLUBS.

Breed.	Club name and secretary's address.
	American Poultry Association, Ross C. H. Hallock, secretary-treasurer, St. Louis, Mo.
CHICKENS.	
Ancona	American Ancona Club, J. Henry Bennett, secretary, Viroqua, Wis.
Blue Andalusian	Blue Andalusian Club of America, E. L. C. Morse, secretary, 9009 Escanaba avenue Chicago, Ill.
Brahma	American Light Brahma Club, Frank P. Johnson, secretary-treasurer, Station A, Indianapolis, Ind.
Do	New England Light Brahma Club, A. J. Rowan, secretary, Watertown, Mass.
Buckeye	National Red Feather Club, R. P. Searle, secretary, 1118 East Bancroft street, Toledo, Ohio.
Cochin	American Cochin Club, Arthur R. Sharp, secretary, Taunton, Mass.
Do	American Buff Cochin Club, C. W. Case, secretary-treasurer, Rochester, Mich.
Cornish	American Cornish Club, F. H. Williams, secretary-treasurer, Minneapolis, Minn.
Dominique	National American Dominique Breeders' Club, W. H. Davenport, secretary-treasurer, Colrain, Mass.
Dorking	American Dorking Club, Robert Officer, secretary-treasurer, North Grafton, Mass.
Faverolle	Faverolle Club of America, M. J. Whitty, secretary, 96 East One hundred and seventy-eighth street, New York, N. Y.
Game	National Exhibition Game and Game Bantam Club, E. J. W. Dietz, secretary-treasurer, Downers Grove, Ill.
Hamburg	Hamburg Fanciers Club, Ralph E. Forbes, secretary, Milton, Mass.
Houdan	American Houdan Club, Daniel P. Shove, secretary-treasurer, Fall River, Mass.
Do	National Houdan Club, E. P. McAvoy, jr., secretary, Cambridge, N. Y.
Langshan	American Langshan Club, A. H. Asche, secretary, Princeton, Ill.
Do	National Langshan Club, John Aldrich, secretary-treasurer, Springfield, Mass.
Do	National Black Langshan Club of America, P. J. Myers, secretary, Crawfordsville, Ind.
Leghorn	American Leghorn Club, W. W. Babcock, secretary-treasurer, Bath, N. Y.
Do	American Rose Comb Brown Leghorn Club, Fred Alger, secretary-treasurer, Wausau, Wis.
Do	American Single Comb Brown Leghorn Club, E. W. Staebler, secretary-treasurer, 2449 Tremont avenue, SW., Cleveland, Ohio.
Do	Single Comb Brown Leghorn Club of America, Miss Sophia C. Pitchlynn, secretary, 114 Sixth street NW., Washington, D. C.
Do	American Buff Leghorn Club, George S. Barnes, secretary-treasurer, Battle Creek, Mich.
Do	National Rose Comb White Leghorn Club, John J. Peters, secretary-treasurer Lincoln, Ill.
Do	National Single Comb White Leghorn Club, Irving F. Rice, secretary-treasurer, Cortland, N. Y.
Do	Single Comb White Leghorn Club of America, Austin G. Brown, secretary, Lakewood, N. J.
Minorca	American Black Minorca Club, George N. Northup, secretary-treasurer, Raceville, N. Y.
Do	American Rose Comb Black Minorca Club, S. T. Campbell, secretary-treasurer, Mansfield, Ohio.
Do	International Rose Comb Black Minorca Club, George H. Northup, secretary-treasurer, Raceville, N. Y.
Orpington	Southwestern Orpington Club, T. J. Humphrey, secretary-treasurer, Bonham, Tex.
Do	National Single Comb Black Orpington Club, Joe Coleman, secretary-treasurer, Carey, Ohio.
Do	National Single Comb Buff Orpington Club, Will H. Schadt, secretary, Goshen, Ind.
Do	American White Orpington Club, Dr. F. E. Bullington, secretary, box 328, Richmond, Va.

Breed.	Club name and secretary's address.
CHICKENS—Contd.	
Plymouth Rock....	American Plymouth Rock Club, H. P. Schwab, secretary-treasurer, Irondequoit, N. Y.
Do.....	American Buff Plymouth Rock Club, William A. Stolts, secretary-treasurer, R. F. D. No. 19, Indianapolis, Ind
Do.....	Partridge Plymouth Rock Club, William F. Fotterall, secretary-treasurer, Oakford, Pa.
Do.....	Silver Penciled Rock Club, William F. Fotterall, secretary-treasurer, Oakford, Pa.
Do.....	White Plymouth Rock Club, Charles H. Ward, secretary-treasurer, Bethel, Conn.
Polish.....	American Polish Club, M. V. Caldwell, secretary-treasurer, R. F. D. No. 5, Lisbon, Ohio.
Rhode Island Red .	Rhode Island Red Club of America, George P. Coffin, secretary-treasurer, Freeport, Me.
Do.....	National Rose Comb Rhode Island Red Club, John E. Davis, secretary-treasurer, 14 Village street, Marblehead, Mass.
Do.....	National Single Comb Rhode Island Red Club, J. H. Valliere, secretary-treasurer, Cedar Rapids, Iowa.
Wyandotte.....	American Buff Wyandotte Club, Henry R. Ingalls, secretary, Greenville, N. Y.
Do.....	National Columbian Wyandotte Club, Edgar E. McIntosh, secretary-treasurer, Stamford, Conn.
Do.....	National Golden Wyandotte Club of America, W. G. Smith, secretary, Bannock, Ohio.
Do.....	Partridge Wyandotte Club of America, H. R. Hildreth, secretary, Worcester, Mass.
Do.....	Eastern Silver Wyandotte Club of America, James C. Patterson, secretary, Nyack, N. Y.
Do.....	Silver Laced Wyandotte Club of America, E. S. Tarbox, secretary-treasurer, Yorkville, Ill.
Do.....	Silver Penciled Wyandotte Club of America, G. S. Boller, secretary, Silver Creek N. Y.
Do.....	National White Wyandotte Club, H. P. Rankin, secretary, Hartington, Nebr.
Bantam.....	International Bantam Breeders' Club, Mrs. Azema J. Kimmey, secretary, Morgan Park, Ill.
Do.....	National Bantam Association, George L. Young, secretary, Brooklyn, N. Y.
GEESE.	
Toulouse.....	National Toulouse Goose Club, Mrs. B. F. Hislop, secretary-treasurer, Milford, Ill.
TURKEYS.	
Bronze.....	National Bronze Turkey Club, E. F. Pullins, secretary-treasurer, R. F. D. No. 1, Rensselaer, Ind.

STANDARDS FOR DAIRY PRODUCTS.

In the table following, prepared in the Dairy Division, are given the standards for dairy products as proclaimed by the Secretary of Agriculture and as established by law in the several States and Territories, so far as obtainable, and revised to May 1, 1908.

The percentages stated represent minimum standards in all cases unless otherwise expressed. States not named are understood to have no laws prescribing standards for dairy products.

United States, State, and Territorial standards for dairy products, 1908.

State.	Milk.			Skim milk.	Cream.	Butter.	Cheese.	Condensed milk.	
	Total solids.	Solids not fat.	Fat.	Total solids.	Fat.	Fat.	Full cream.	Total solids.	Fat.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
United States[a]	.....	8.5	3.25	9.25	18	82.5	[b] 50	28	7
California	.....	8.5	3	9.25	18	80	30	28	7.7
Colorado	.....	.....	.....	.....	.....	.....	35	.....	.....
Connecticut	11.75	8.5	3.25	.....	.....	.....	.....	.....	.....
Dist. Columbia	.....	9	3.5	9.3	20	[c] 83	.....	.....	.....
Delaware	No standards.								
Florida	Local municipal ordinances.								

[a] Standard of Purity for Food Products. United States Department of Agriculture, Office of the Secretary, Circular 19.
[b] Per cent of total solids.
[c] Not over 12 per cent water or 5 per cent salt.

United States, State, and Territorial standards for dairy products, 1908—Continued.

State.	Milk.			Skim milk.	Cream.	Butter.	Cheese.	Condensed milk.	
	Total solids.	Solids not fat.	Fat.	Total solids.	Fat.	Fat.	Full cream.	Total solids.	Fat.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Georgia	12	8.5	3.25	9.25	18	82.5	a 50	28	7
Hawaii	11.5		2.50						
Idaho	11	8	3	9.25	18	82.5	30	28	7
Illinois			3		15	80	a 48		
Indiana		8.5	3.25	9.25	18	82.5	a 50	28	7.7
Iowa	12.5		3		15	80			
Kentucky	12	8.5	3.25	9.25	18	82.5	a 50	28	7.7
Louisiana	Municipal control.								
Maine	12		3						
Maryland	12.5		3.5					(b)	
Massachusetts	12.15		3.35	9.3	15				
Michigan	12.5 (Sp. gr. 29–33)		3	Sp. gr. 32	15				
Minnesota	13		3.5		20	80	a 45		
Missouri		8.5	3.25	9.25	18	82.5	a 50	28	7.7
Montana	12	9	3		15				
Nebraska			3		18				
New Hampshire	13	9.5	3.5	9					
New Jersey	12		3		16				
New Mexico	None.								
New York	12		3					(b)	
North Carolina	12	8.5	3.25		18	82.5	a 50	28	7
North Dakota	12		3		15				
Ohio	12		3			80		(b)	
Oklahoma	None.								
Oregon	12.2	9	3.2		20		30	22	4.5
Pennsylvania	12		3	8			32		
Porto Rico	12		3			80	30		
South Carolina	None; municipal control.								
South Dakota	13		3		18	80	a 45		
Tennessee	Local control.								
Texas	12.5		3						
Utah	12	8.8	3.2	9	30	80	a 50	28	7
Vermont	12.5	9.25	4						
May and June	12								
Virginia		8.5	3.25	9.25	18			26	7.5
Washington		8	3				30		
Wisconsin		8.5	3		18	82.5	a 50	28	7
Wyoming	12		2.4			80	20	(b)	
May and June	11.5								

[a] Per cent of total solids.
[b] Proportion of fat to total solids must be the same as in the crude milk.

NOTE.—Circular 19 from the Office of the Secretary of Agriculture establishes a standard of 14 per cent milk fat for ice cream; this standard has also been adopted by the States of Missouri, Kentucky, and Indiana; Idaho has a 12 per cent standard, and the city of Memphis, Tenn., by municipal ordinance, an 8 per cent standard.

CONTAGIOUS DISEASES OF ANIMALS IN FOREIGN COUNTRIES.

A number of foreign countries maintain sanitary supervision over their live stock and publish reports concerning contagious diseases of domestic animals. These reports are issued periodically, the majority of them once a month. They indicate the status of the different diseases from time to time, and this information for the year 1907 has been arranged in tables which appear further on. An examination of these tables shows that the figures in most instances refer to new cases occurring during the month, and these are added up so as to give a total for the year. In some instances, however, the figures refer to the condition of affairs at certain specified intervals, so that no annual totals can be given.

The alarming spread of foot-and-mouth disease which took place in western continental Europe in the fall of 1906 has continued to be in evidence throughout the year. The principal features of the animal diseases in foreign countries are mentioned in the following résumé, after which are given the tabulated figures for each country in alphabetical order.

Belgium.—There had been no cases of foot-and-mouth disease reported for eighteen months prior to November, 1906, when the infection was carried over from France, where the disease had prevailed for several months. The sanitary police succeeded in getting it somewhat under control at the end of six months, and this condition continued until October, when the number of cases showed a marked increase continuing in November, but fell off during December. There was a large increase in the cases of rabies as compared with the previous year.

France.—Not much improvement was effected in the foot-and-mouth disease situation until the last two months of the year, the disease being quite prevalent throughout the first ten months. The total outbreaks during the year numbered 15,456, as against 8,050 in 1906. Rabies was again a widespread disease, although the total number of cases was slightly less than in the preceding year. There was little change in the other diseases, excepting a distinct diminution in the outbreaks of glanders and farcy.

Great Britain.—The British returns show an increase in the cases of anthrax, sheep scab, and swine fever, and a decrease in glanders. There have been no cases of foot-and-mouth disease or rabies reported since 1901. The outbreaks of swine fever in 1907 have doubled as compared with the preceding year.

The British reports state that a new disease has been recognized by Sir John McFadyean as affecting bovine animals in England, to which the name of Johne's disease has been given. It attacks the intestinal canal and in its manifestations closely resembles the mesenteric form of tuberculosis and parasitic gastro-enteritis, for which diseases it has no doubt been frequently mistaken. It is reported to be of more frequent occurrence and wider distribution than has been generally recognized, is practically incurable, and, in the opinion of experts, calls for immediate legislation.

Italy.—The swine diseases were somewhat less prevalent than formerly. There was a considerable increase in the cases of sheep scab, and a very large increase in foot-and-mouth disease, which was enormously prevalent. The totals for this disease have been high for a number of years, but the cases in 1907 were far in excess of the number in recent years.

The Netherlands.—The visitation of foot-and-mouth disease did not seriously affect the Netherlands until June, 1907. There had been

a few cases as far back as the previous November and continuing during the three following months, but as there were none reported in March and April it appeared as if the contagion had been stamped out. The malady appeared again, however, in May, and spread enormously during the summer months. A gradual subsidence occurred in the succeeding months, and the authorities appeared to be getting the disease under control at the close of the year.

Switzerland.—The Swiss reports show a great increase of foot-and-mouth disease in the first six months of the year. There were also considerable increases in the cases of swine diseases and of sheep scab as compared with 1906.

AUSTRIA.

Number of premises infected with contagious diseases of animals in Austria at monthly periods during 1907.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Foot-and-mouth disease	180	38	24	3	2	.....
Anthrax	22	14	8	10	15	31
Glanders and farcy	9	9	4	12	14	9
Scab:						
Horses	28	44	64	83	78	59
Sheep	3	3	9	4	3	19
Goats	5	2	5	13	46	61
Blackleg	9	1	5	1	2	3
Erysipelas of swine	280	199	99	81	43	208
Hog cholera and swine plague	395	287	285	254	365	351
Blisters upon genitals	47	73	130	245	213	235
Rabies	24	36	26	18	27	17

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Foot-and-mouth disease	14	40	107	249	653	554
Anthrax	14	21	25	32	14	6
Glanders and farcy	14	20	18	15	16	18
Scab:						
Horses	42	37	43	41	37	40
Sheep	15	1	3	4	1	1
Goats	67	45	46	47	43	2
Blackleg	3	9	4	16	.....	4
Erysipelas of swine	557	1,337	1,290	1,309	881	309
Hog cholera and swine plague	393	513	569	610	598	501
Blisters upon genitals	164	70	90	45	16	.....
Rabies	23	16	22	26	16	13

BELGIUM.

Cases of contagious diseases in Belgium during 1907.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Glanders and farcy	7	7	1	1	2	3
Foot-and-mouth disease:						
Cattle	3,429	1,828	1,432	883	393	492
Sheep	512	267	360	123	3	.....
Goats	51	6	6	5	.....	.....
Swine	1,346	730	420	178	52	60
Rabies:						
Cases	9	5	6	10	16	19
Suspects	10	28	14	8	12	11
Anthrax	58	55	62	75	67	49
Blackleg	10	12	14	23	25	30
Foot rot	.....	.....	.....	.....	.....	.....
Sheep scab	.....	.....	.....	60	.....	.....

BELGIUM—Continued.

Cases of contagious diseases in Belgium during 1907—Continued.

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Glanders and farcy	13	8	3	3	.....	.....	48
Foot-and-mouth disease:							
Cattle	340	335	313	1,642	2,423	704	14,214
Sheep	1	.....	.....	.....	1	.....	1,268
Goats	.....	.....	2	4	2	.....	76
Swine	9	112	52	66	196	30	3,251
Rabies:							
Cases	24	29	27	27	29	25	226
Suspects	18	25	7	17	17	12	179
Anthrax	41	59	54	59	50	58	687
Blackleg	21	31	42	35	34	22	299
Foot rot	.....	.....	.....	8	.....	12	20
Sheep scab	.....	.....	.....	137	.....	50	247

DENMARK.

Outbreaks of contagious diseases of animals in Denmark during 1907.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Anthrax	8	17	19	16	9	13
Spinal meningitis	1	2	1	3	3	.....
Glanders and farcy	.....	.....	.....	2	1	.....
Malignant catarrhal fever	7	5	7	9	11	8
Erysipelas of swine, acute	5	5	8	15	17	12
Hog cholera, chronic	.....	4	6	4	8	10

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Anthrax	6	4	5	11	21	17	146
Spinal meningitis	3	2	2	1	1	1	20
Glanders and farcy	1	2	1	2	.....	2	12
Malignant catarrhal fever	9	13	4	3	3	4	83
Erysipelas of swine, acute	18	30	28	57	45	22	262
Hog cholera, chronic	3	1	5	2	1	2	46

FRANCE.

Status of contagious diseases of animals in France during 1907.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Foot-and-mouth disease (outbreaks)	2,154	1,839	1,596	1,476	655	751
Sheep scab (outbreaks)	18	20	9	8	63	54
Sheep pox (outbreaks)	7	10	.....	.....	.....	1
Anthrax (outbreaks)	32	17	37	48	44	26
Blackleg (outbreaks)	44	41	57	49	37	50
Glanders and farcy:						
Number of outbreaks	24	25	21	23	13	24
Horses slaughtered	27	28	33	20	31	36
Rabies (cases)	125	147	158	155	200	203
Erysipelas of swine (outbreaks)	27	27	24	21	39	64
Infectious pneumo-enteritis of swine (outbreaks)	10	15	13	9	17	17

FRANCE—Continued.

Status of contagious diseases of animals in France during 1907—Continued.

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Foot-and-mouth disease (outbreaks)	1,072	2,265	1,982	1,152	321	193	15,456
Sheep scab (outbreaks)	3	3	5	34	11	14	242
Sheep pox (outbreaks)	7	12	10	18	42	7	114
Anthrax (outbreaks)	29	66	44	33	49	32	457
Blackleg	59	59	86	96	100	75	753
Glanders and farcy:							
Number of outbreaks	24	25	37	18	34	27	295
Horses slaughtered	34	29	46	27	43	31	385
Rabies (cases)	268	146	122	118	132	118	1,892
Erysipelas of swine (outbreaks)	58	54	42	56	76	77	565
Infectious pneumo-enteritis of swine (outbreaks)	21	19	14	19	16	40	210

GERMANY.

Number of localities and farms infected with contagious diseases of animals in Germany at monthly periods during 1907.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Glanders and farcy:						
Localities	29	22	26	25	27	26
Farms	34	28	33	33	32	29
Pleuro-pneumonia:						
Localities	.....	.....	.....	1	1	.....
Farms	.....	.....	.....	1	1	.....
Foot-and-mouth disease:						
Localities	60	40	41	84	65	19
Farms	146	169	187	235	223	62
Swine plague and hog cholera:						
Localities	1,678	1,527	1,516	1,496	1,541	1,566
Farms	2,309	2,095	2,034	1,889	1,989	2,244

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Glanders and farcy:						
Localities	26	28	34	41	46	44
Farms	29	30	37	48	59	55
Pleuro-pneumonia:						
Localities	.....	1	2	1	2	2
Farms	.....	1	2	1	2	2
Foot-and-mouth disease:						
Localities	23	17	15	15	13	61
Farms	66	64	41	66	64	165
Swine plague and hog cholera:						
Localities	1,567	1,456	1,448	1,525	1,476	1,408
Farms	2,298	2,173	2,065	2,150	2,053	1,893

GREAT BRITAIN.

Annual status of contagious diseases of animals in Great Britain in 1901–1907.

Diseases.	1901.	1902.	1903.	1904.	1905.	1906.	1907.
Foot-and-mouth disease:							
Outbreaks	12	.....	.....	.....	.....	.....	.....
Cases	669	.....	.....	.....	.....	.....	.....
Glanders and farcy:							
Outbreaks	1,347	1,155	1,456	1,529	1,214	1,070	850
Cases	2,370	2,040	2,499	2,658	2,068	2,012	1,934
Sheep scab:							
Outbreaks	1,537	1,632	1,792	1,418	918	534	751
Cases	22,674	21,523	24,431	.....	.....	.....	.....
Anthrax:							
Outbreaks	651	678	767	1,049	970	939	1,089
Cases	971	1,032	1,143	1,589	1,317	1,325	1,466
Rabies (cases)	1	.....	.....	.....	.....	.....	.....
Swine fever:							
Outbreaks	3,140	1,688	1,478	1,196	817	1,280	2,336
Swine slaughtered (diseased or exposed)	15,237	8,263	7,933	5,603	3,876	7,359	11,275

HUNGARY.

Number of premises infected with contagious diseases of animals in Hungary at monthly periods during 1907.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Anthrax	42	37	39	55	59	94
Rabies	110	119	160	174	136	176
Glanders and farcy	43	42	39	49	82	86
Foot-and-mouth disease	52	6	8	12	4	10
Sheep pox	144	145	135	107	74	39
Blisters upon genitals	16	18	154	309	393	323
Scab:						
Solipeds	119	248	389	866	1,086	933
Sheep	169	188	155	177	174	152
Erysipelas of swine	348	249	174	113	160	805
Hog cholera	2,817	1,911	1,403	992	867	1,859
Barbone of buffalo	24	7	2	3	6	30

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Anthrax	130	235	334	410	333	217
Rabies	201	172	153	142	132	150
Glanders and farcy	54	58	62	58	51	36
Foot-and-mouth disease	80	726	1,162	1,977	2,824	2,172
Sheep pox	17	28	52	152	186	181
Blisters upon genitals	173	161	72	52	35	22
Scab:						
Solipeds	792	510	407	299	200	117
Sheep	160	105	139	75	70	116
Erysipelas of swine	2,420	2,970	1,638	1,905	1,270	834
Hog cholera	4,032	6,120	7,029	6,655	5,028	3,346
Barbone of buffalo	10	18	26	17	18	11

INDIA (BRITISH).

Number of deaths from principal contagious diseases of animals in Province of Bengal, fiscal year 1906–7.

Name of disease.	Number of animals died.	Name of disease.	Number of animals died.
Rinderpest	12,041	Glanders	875
Foot-and-mouth disease	3,133	Surra	10
Hemorrhagic septicemia	739	Dourine	2
Blackleg	388	Rabies	55
Anthrax	467		

IRELAND.

Annual status of contagious diseases of animals in Ireland, 1901–1907.

Diseases.	1901.	1902.	1903.	1904.	1905.	1906.	1907.
Anthrax:							
Outbreaks	2	.....	4	4	4	4	3
Cases	4	.....	11	7	4	8	5
Glanders and farcy:							
Outbreaks	5	10	5	11	30	8	6
Cases	6	43	7	34	107	16	11
Rabies:							
Cases	2	.....	2	.....	.....	.....	.....
Sheep scab:							
Outbreaks	545	613	655	486	339	256	326
Cases	7,564	7,818	8,306	6,433	4,253	3,513	.....
Swine fever:							
Outbreaks	220	166	175	181	137	95	161
Cases	1,325	993	1,079	931	1,416	1,103	2,789
Epizootic lymphangitis:							
Outbreaks	.....	.....	.....	1	10	1	(a)
Cases	.....	.....	.....	1	25	1	(a)
Parasitic mange:							
Outbreaks	174	161	195	162	169	85	(a)
Cases	331	221	295	252	322	130	(a)

a Figures for 1907 not available.

ITALY.

Cases of contagious diseases of animals in Italy during 1907.

Name of disease.	Jan.	Feb.	Mar.[a]	Apr.	May.	June.
Anthrax	145	54	100	91	219	181
Blackleg	14	12	24	23	10	22
Foot-and-mouth disease	44,810	31,769	32,868	41,792	42,078	33,781
Tuberculosis	125	51	.....	.....	.....	.....
Glanders and farcy	59	45	30	43	60	27
Sheep pox	.....	.....	.....	.....	.....	.....
Barbone of buffalo	.....	1	.....	.....	.....	3
Sheep scab	397	623	1,545	2,521	3,267	5,167
Rabies	56	116	106	88	36	35
Infectious disease of swine	641	784	915	1,154	2,025	1,042
Contagious mammitis	.....	736	.....	400	1,320	1,068

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.[a]
Anthrax	279	764	460	460	77	150	2,980
Blackleg	31	43	45	46	88	36	394
Foot-and-mouth disease	29,862	34,204	6,337	6,771	8,726	25,444	338,442
Tuberculosis	.....	.....	.....	.....	.....	.....	176
Glanders and farcy	19	50	34	25	76	44	512
Sheep pox	137	.....	.....	11	[b] 7	[b] 4	159
Barbone of buffalo	101	58	37	10	.....	.....	210
Sheep scab	3,523	4,118	1,896	1,324	404	2,675	27,460
Rabies	56	43	31	52	60	22	701
Infections disease of swine	782	1,342	335	966	661	660	11,307
Contagious mammitis	906	493	207	15	176	70	5,391

[a] Not including two weeks, March 3–10 and 17–24, for which reports were not received.
[b] Cowpox.

THE NETHERLANDS.

Cases of contagious diseases of animals in the Netherlands during 1907.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Foot-and-mouth disease	175	11	.....	.....	195	5,843
Glanders and farcy	8	3	3	9	10	4
Sheep scab	255	42	62	34	81	49
Foot rot of sheep	11	5	28	18	22	14
Anthrax	38	49	52	42	32	31
Erysipelas of swine	9	8	7	10	43	142
Rabies	12	5	5	3	2	2

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Foot-and-mouth disease	46,398	137,243	98,105	38,681	12,023	2,613	341,287
Glanders and farcy	9	.....	4	2	4	2	58
Sheep scab	282	42	130	273	8	246	1,504
Foot rot of sheep	96	15	40	16	37	24	326
Anthrax	30	48	36	35	29	49	471
Erysipelas of swine	258	232	215	72	52	.....	1,048
Rabies	3	2	.....	1	1	.....	36

NORWAY.

Number of cases of contagious diseases of animals in Norway during 1907.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Anthrax	47	62	48	58	51	44
Blackleg	2	4	5	3	.....	3
Braxy of sheep	2	.....	1	16	11	8
Malignant catarrh	31	42	49	48	60	49
Hog cholera and swine plague	100	.....	296	7	42	4

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Anthrax	45	31	27	28	34	28	503
Blackleg	6	1	7	2	2	1	36
Braxy of sheep	2	1	2	11	29	12	95
Malignant catarrh	77	46	25	26	34	24	511
Hog cholera and swine plague	1	4	.....	.....	34	.....	488

SWEDEN.

Outbreaks of contagious diseases of animals in Sweden during 1907.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Anthrax	14	25	19	35	42	10
Blackleg	2	4	3	1	3	5
Swine diphtheria	.....	.....	.....	.....	.....	.....
Septicemia hemorrhagica of swine	2	.....	.....	.....	.....	.....
Erysipelas of swine	1	.....	.....	1	.....	.....

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Anthrax	15	3	12	7	19	18	219
Blackleg	5	5	4	5	9	3	49
Swine diphtheria	.....	.....	1	.....	.....	.....	1
Septicemia hemorrhagica of swine	1	5	7	5	8	4	32
Erysipelas of swine	.....	2	3	3	3	2	15

SWITZERLAND.

Cases of contagious diseases of animals in Switzerland during 1907.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Blackleg	7	17	16	29	32	87
Anthrax	40	45	38	29	42	48
Foot-and-mouth disease	323	1,357	2,309	1,249	818	807
Glanders and farcy	.....	1	1	.....	.....	.....
Erysipelas and hog cholera	294	172	432	488	507	661
Sheep scab	3	.....	35	.....	.....	12
Rabies	.....	2	2	.....	.....	.....

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Blackleg	198	211	182	57	27	64	927
Anthrax	29	26	34	40	20	28	419
Foot-and-mouth disease	70	103	49	76	26	138	7,325
Glanders and farcy	1	.....	.....	3	.....	6	12
Erysipelas and hog cholera	562	1,184	1,049	1,108	773	613	7,745
Sheep scab	.....	.....	55	.....	.....	.....	105
Rabies	.....	.....	.....	2	.....	.....	.....

PUBLICATIONS OF THE BUREAU IN 1907.

Following is a list of publications issued by the Bureau of Animal Industry during the year 1907, excepting regulations, which are to be found in the appendix to this report. A circular giving a list of the available publications of the Bureau and indicating how they may be obtained will be sent free upon request.

Publications in the following list for which no price is indicated will be sent free of charge to persons in the United States, so long as the editions permit, on application to the Secretary of Agriculture, Washington, D. C.

Applications for publications to which a price is affixed should be made to the Superintendent of Documents, Government Printing Office, Washington, D. C., the officer designated by law to sell Government publications. All payments should be made to him and not to the Department of Agriculture, and should be sent by postal money order, express order, or New York draft. Currency may be sent at the sender's risk, but postage stamps, foreign money, and uncertified checks will not be accepted. No charge is made for postage on documents forwarded to points in the United States, Guam, Hawaii, the Philippine Islands, or Porto Rico, or to Canada, Cuba, or Mexico. To other countries the regular rate of postage is charged, and remittances must cover such postage. To residents of foreign countries the price of 6 cents a copy, including postage, has been fixed for publications for which no price is indicated in the list.

REPORTS.

Twenty-second Annual Report of the Bureau of Animal Industry. By A. D. Melvin, Chief of Bureau. Pp. 364, pls. 23, figs. 22. Price 50 cents.

Report of the Chief of the Bureau of Animal Industry for [the fiscal year ended June 30] 1907. Pp. 69.

Special Report on Diseases of the Horse, revised 1907. By Drs. Pearson, Michener, Law, Harbaugh, Trumbower, Liautard, Holcombe, Huidekoper, Stiles, Mohler, and Adams. Pp. 608, pls. 41, figs. 18. Price 65 cents.

BULLETINS.

Bulletin 39. Index-Catalogue of Medical and Veterinary Zoology. By Ch. Wardell Stiles, Consulting Zoologist, and Albert Hassall, Assistant in Zoology. Part 17. Authors: M to Martirano. Pp. 1209–1304. Price 15 cents.

Same, Part 18. Authors: Martius to Mitrofanow. Pp. 1305–1398. Price 15 cents.

Same, Part 19. Authors: Mitschein to Myrepsus. Pp. 1399–1492. Price 15 cents.

Bulletin 92. The Milking Machine as a Factor in Dairying. (A Preliminary Report.) I.—Practical Studies of a Milking Machine. By C. B. Lane, Assistant Chief of the Dairy Division. II.—Bacteriological Studies of a Milking Machine. By W. A. Stocking, jr., Bacteriologist, Storrs (Conn.) Agricultural Experiment Station. Pp. 55, pls. 4, figs. 6. Price 15 cents.

Bulletin 94. Investigations in the Use of the Bomb Calorimeter. By J. August Fries, Assistant Expert in Animal Nutrition. Pp. 39. Price 10 cents.

Bulletin 95. The Bacteriolytic Power of Blood Serum of Hogs. By B. M. Bolton, Bacteriologist, Biochemic Division. Pp. 62, figs. 4. Price 10 cents.

Bulletin 96. A Comparative Study of Tubercle Bacilli from Varied Sources. By John R. Mohler, Chief of Pathological Division, and Henry J. Washburn, Assistant Chief of Pathological Division. Pp. 88, pls. 6. Price 40 cents.

Bulletin 97. Proceedings of a Conference of Federal and State Representatives to Consider Plans for the Eradication of the Cattle Tick, held at Nashville, Tenn., December 5 and 6, 1906. Pp. 98. Price 15 cents.

Bulletin 98. Investigations in the Manufacture and Curing of Cheese. VII.—Directions for Making the Camembert Type of Cheese. By Theodore W. Issajeff, Expert Cheese Maker, Dairy Division. Pp. 21, figs. 10. Price 5 cents.

Bulletin 99. The Danger from Tubercle Bacilli in the Environment of Tuberculous Cattle. By E. C. Schroeder, Superintendent of Experiment Station, and W. E. Cotton, Expert Assistant at Experiment Station. Pp. 24. Price 5 cents.

Bulletin 100. The Germicidal Value of Liquor Cresolis Compositus (U. S. P.). By C. N. McBryde, Bacteriologist, Biochemic Division. Pp. 24. Price 5 cents.

CIRCULARS.

Circular 23 (third revision). Directions for the Use of Blackleg Vaccine. Pp. 8, figs. 3.

Circular 31 (second revision). Blackleg: Its Nature, Cause, and Prevention. Revised by John R. Mohler, Chief of the Pathological Division. Pp. 24, fig. 1.

Circular 101. The New Meat-Inspection Law and Its Bearing Upon the Production and Handling of Meat. By George P. McCabe, Solicitor, Department of Agriculture. Pp. 16.

Circular 102. Stomach Worms (*Hæmonchus contortus*) in Sheep. By B. H. Ransom, Chief of the Division of Zoology. Pp. 7.

Circular 103. Records of Dairy Cows: Their Value and Importance in Economic Milk Production. By Clarence B. Lane, Assistant Chief of the Dairy Division. Pp. 38, figs. 10. (Reprint from the Twenty-second Annual Report of the Bureau of Animal Industry, 1905.)

Circular 104. Welsh Black Cattle. By John Roberts, of the Editorial Office. Pp. 29, pls. 5. (Reprint from the Twenty-second Annual Report of the Bureau of Animal Industry, 1905.)

Circular 105. Baby Beef. By Ernest G. Ritzman, Assistant Animal Husbandman. Pp. 34, figs. 6. (Reprint from the Twenty-second Annual Report of the Bureau of Animal Industry.)

Circular 106. Publications of the Bureau of Animal Industry. Pp. 24.

Circular 107. Capons and Caponizing. By Rob R. Slocum, Poultry Assistant. Pp. 10, figs. 7. (Reprint from the Twenty-second Annual Report of the Bureau of Animal Industry, 1905.)

Circular 108. Trichinosis: A Danger in the Use of Raw Pork. By B. H. Ransom, Chief of the Division of Zoology. Pp. 6, figs. 5. .

Circular 109. Quail Disease in the United States. (A Preliminary Report.) By George Byron Morse, Assistant in Bacteriology and Pathology, Division of Pathology. Pp. 11, figs. 3.

Circular 110. Methods of Eradicating Cattle Ticks. By Louis A. Klein, Expert in Texas Fever, Pathological Division. Pp. 16, figs. 3.

Circular 111. Sanitary Relations of the Milk Supply. (Report of a Committee on Sanitary Relations to a Conference Appointed by the Commissioners of the District of Columbia to Consider and Report upon the Local Milk Supply.) Pp. 7. (Since included in Circular 114.)

Circular 112. Relative Proportions of the Sexes in Litters of Pigs. By George M. Rommel, Animal Husbandman. P. 1.

Circular 113. Classification for American Carriage Horses. Pp. 4.

Circular 114. Sanitary Milk Production. Report of a Conference Appointed by the Commissioners of the District of Columbia, with Accompanying Papers. Pp. 38.

Circular 115. Officials, Associations, Commissions, and Educational Institutions Connected with the Dairy Interests of the United States for the Year 1907. By Ed. H. Webster. Pp. 22.

Circular 116. Notes on Parasitic Nematodes, Including Descriptions of New Genera and Species, and Observations on Life Histories. By Brayton H. Ransom, Chief of the Division of Zoology. Pp. 7.

Circular 117. A City Milk and Cream Contest as a Practical Method of Improving the Milk Supply. By C. B. Lane, Assistant Chief of the Dairy Division, and Ivan C. Weld, Assistant Dairyman. Pp. 28.

Circular 118. The Unsuspected but Dangerously Tuberculous Cow. By E. C. Schroeder, Superintendent of Experiment Station. Pp. 19, figs. 7.

Circular 119. Notes on Experiments with Blackhead of Turkeys. By Cooper Curtice, Veterinarian, Rhode Island Experiment Station. Pp. 10.

FARMERS' BULLETINS.

Farmers' Bulletin 51, Standard Varieties of Chickens. By George E. Howard. Revised by G. Arthur Bell, Assistant Animal Husbandman. Pp. 48, figs. 25.

Farmers' Bulletin 287. Poultry Management. By G. Arthur Bell, Assistant Animal Husbandman. Pp. 48, figs. 14.

APPENDIX.

RULES AND REGULATIONS OF THE SECRETARY OF AGRICULTURE RELATING TO THE ANIMAL INDUSTRY ISSUED IN 1907.

AMENDMENT NO. 8 TO B. A. I. ORDER NO. 137.

Amendment to Regulations 50, 53, 55, 56, 61, and 64, Governing the Interstate and Foreign Transportation of Meats and Meat Food Products.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., January 21, 1907.

For the purpose of preventing the use in interstate or foreign commerce of meats and meat food products which are unsound, unwholesome, unhealthful, or otherwise unfit for human food, under authority conferred upon the Secretary of Agriculture by the provisions of the act of Congress approved June 30, 1906 (34 Stat., 674), the following amendments to Regulations 50, 53, 55, 56, 61, and 64 are hereby prescribed for the transportation in interstate and foreign commerce of the carcasses, parts of carcasses, meats, and meat food products of cattle, sheep, swine, and goats.

This amendment, which for the purpose of identification is designated as Amendment No. 8 to B. A. I. Order No. 137, shall become and be effective on and after February 1, 1907.

JAMES WILSON, *Secretary of Agriculture.*

Regulation 50.—Paragraph (*j*) of Regulation 50, as amended by Amendments Nos. 4 and 7 to B. A. I. Order No. 137, is hereby further amended by changing the wording of the proviso (commencing with the seventh line of said paragraph as it appears in Amendment No. 4) to read as follows: "*Provided,* That during the months of October, November, and December, 1906, and January, February, and until March 15, 1907, shippers who are in possession" etc. The effect of this amendment is to allow until March 15, 1907, to dispose of the remaining sweet pickled, dry salted, smoked, and other similar meats, lard, lard compounds, etc., which were prepared or were in process of preparation prior to October 1, 1906.

Regulations 53, 55, 56, 61, and 64.—The requirement of each of the above regulations that car numbers and initials shall be shown on the various shipping certificates is hereby modified to include only carload shipments. On certificates for less than carload shipments the car numbers and initials need not be shown.

AMENDMENT NO. 9 TO RULE 1, REVISION 1.

To Prevent the Spread of Splenetic Fever in Cattle (Effective from February 4 to February 28, 1907).

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The provisions of Rule 1, Revision 1, to prevent the spread of splenetic fever in cattle, effective on and after February 1, 1906, and Amendment No. 6 thereto, effective on and after October 1, 1906, are hereby modified in so far as they affect the county of Greer, in the Territory of Oklahoma, as follows:

Cattle of Greer County, Okla., may, during the remainder of the month of February, 1907, be moved to any point in the United States not in the Territory of Oklahoma which is located outside of the modified quarantined area: *Provided*, That such cattle first shall have been inspected and found free from ticks (*Boophilus annulatus*), a written permit for their movement shall have been issued by an inspector of the Bureau of Animal Industry, and permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Done at Washington this fourth day of February, 1907.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] W. M. HAYS, *Acting Secretary of Agriculture.*

AMENDMENT NO. 9 TO B. A. I. ORDER NO. 137.

Providing for a Regulation Governing the Transportation of Meat by Ferry in Interstate Commerce, and Amending the Certificate Prescribed by Regulation 53 (as Found in Amendment No. 2 of Aforesaid Order).

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., March 15, 1907.

For the purpose of preventing the transportation by ferry lines operating as common carriers between one State, Territory, or the District of Columbia and another State, Territory, or the District of Columbia of meat and meat food products which are unsound, unhealthful, unwholesome, or otherwise unfit for human food, under the authority conferred upon the Secretary of Agriculture by the provisions of the act of Congress approved June 30, 1906 (34 Stat., 674), the following regulation is hereby prescribed for the transportation in interstate commerce of any carcass, part of carcass, and meat food product of cattle, sheep, swine, or goats by ferry operating in the manner as above set forth; and the following amendment to the certificate prescribed by Regulation 53 is hereby made for the transportation in interstate and foreign commerce of the meat and meat food products of cattle, sheep, swine, and goats.

Regulation 65 shall become and be effective at once, but the amended form of certificate prescribed by Regulation 53 shall not be required until on and after May 1, 1907. For the purpose of identification this amendment is designated as Amendment No. 9 to B. A. I. Order No. 137.

JAMES WILSON, *Secretary of Agriculture.*

Regulation 65.—When any carcass, part of carcass, or meat food product of cattle, sheep, swine, or goats loaded on a truck, wagon, cart, or other vehicle, or otherwise prepared for shipment is offered for transportation or transported by ferry from one State, Territory, or the District of Columbia to another State, Territory, or the District of Columbia, the person, firm, or corporation offering such carcass, part of carcass, or meat food product shall make a certificate in one of the following forms and deliver the certificate to said common carrier, and no person, firm, or corporation operating a ferry line, as aforesaid, shall receive for transportation or transport any carcass, part of carcass, or meat product of cattle, sheep, swine, or goats loaded on a truck, wagon, cart, or other vehicle, or in any other manner prepared for transportation unless a certificate in one of the following forms is properly filled out and delivered by the shipper as herein required.

(a) To be used when the shipment consists of United States inspected and passed meat or meat food product.

(Date)_____, 190 . .
Name of ferry line to which offered_____
Shipper_____
Consignee_____
Point of shipment_____
Destination_____

The following described meat or meat food product has been inspected and passed according to act of Congress of June 30, 1906, and is so marked, and at this date is sound, healthful, wholesome, and fit for human food.

(Kind of product and weight.)

_____
_____
_____
_____
(Signature.)

(b) To be used when the shipment is made under exemption and consists of meat or meat food product which has not been U. S. inspected and passed.

(Date)_____, 190 .
Name of ferry line to which offered_____
Shipper_____
Consignee_____
Point of shipment_____
Destination_____

I hereby certify that I am a retail butcher or a retail dealer in meat or meat food product, and the following-described meat or meat food product is offered for shipment in interstate commerce to a customer, as exempted from inspection according to act of Congress of June 30, 1906, and exemption certificate No. ——. The said meat or meat food product is sound, healthful, wholesome, and fit for human food.

(Kind of product and weight.)

_____
_____
_____

_____
(Signature of retail butcher or dealer.)

_____
(Address.)

(c) To be used when the shipment is made by a farmer and consists of meat or meat food product which has not been U. S. inspected and passed.

(Date)_____, 190 .
Name of ferry line to which offered_____
Shipper_____
Consignee_____
Point of shipment_____
Destination_____

I hereby certify that I am a farmer, and that the following-described meat or meat food product is from animals that have been slaughtered by me upon my farm, without U. S. inspection, and is offered for shipment in interstate commerce as exempted from inspection according to act of Congress of June 30, 1906. The said meat or meat food product is sound, healthful, wholesome, and fit for human food.

(Kind of product and weight.)

_____
_____
_____

_____
(Signature of farmer.)

_____
(Address of farmer.)

Regulation 53.—The certificate prescribed by said regulation is hereby amended by inserting after the words "and are so marked" the following words: "and at this date are sound, healthful, wholesome, and fit for human food."

[B. A. I. ORDER NO. 143.]

Regulations of the Secretary of Agriculture Governing the Inspection, Disinfection, Certification, Treatment, Handling, and Method and Manner of Delivery and Shipment of Live Stock which is the Subject of Interstate Commerce (Effective April 15, 1907).

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., March 22, 1907.

The following regulations governing the inspection, disinfection, certification, treatment, handling, and method and manner of delivery and shipment of live stock which is the subject of interstate commerce are issued for the guidance of all persons and corporations concerned in the handling or movement of live stock. For purposes of identification these regulations are designated as B. A. I. Order No. 143. The regulations heretofore issued by the Secretary of Agriculture on this subject, under date of May 1, 1905, effective on and after June 1, 1905, and all amendments thereto, are hereby revoked, to take effect April 15, 1907, on and after which date the regulations herein published shall become and be effective until otherwise ordered.

JAMES WILSON, *Secretary of Agriculture.*

GENERAL REGULATIONS.

Regulation 1.—Wherever in these regulations, or in the rules based thereon, the word "interstate" is used, it shall be construed to mean "between one State or Territory or the District of Columbia and another State or Territory or the District of Columbia."

Regulation 2.—When the Secretary of Agriculture shall determine the fact that cattle or other live stock in a State or Territory or the District of Columbia are affected with any contagious, infectious, or communicable disease notice will be given of that fact. A rule will be issued placing in quarantine all or a portion of the State or Territory or the District of Columbia in which the disease exists, and this rule will either absolutely forbid the interstate movement of live stock from the quarantined area or will indicate the regulations under which interstate movements may be made.

Regulation 3.—Before offering cattle or other live stock for interstate transportation, or so transporting them, or introducing them into any public stock yards or upon routes of traffic for interstate transportation, all persons or corporations are required to exercise reasonable diligence to ascertain that such animals are not affected with any contagious or infectious disease, and have not been exposed to the contagion or infection of disease by contact with other animals so diseased or by location in or upon pens, premises, cars, or other vehicles that have contained diseased animals.

Regulation 4.—Premises, cars, boats, and other vehicles that have contained diseased or exposed cattle or other live stock shall not be used in the interstate transportation of healthy animals until the said premises, cars, boats, and other vehicles shall have been cleaned and disinfected as hereinafter provided. If the facilities for cleaning and disinfecting cars can not be provided at the point where the diseased or exposed cattle or other live stock are unloaded therefrom, the transportation company shall seal and forward the infectious cars to a point to be agreed upon between an agent of the company and a representative of the Bureau of Animal Industry, and shall there clean and disinfect the said cars in the presence of an employee of the Bureau of Animal Industry.

Regulation 5.—Cars, boats, and other vehicles for use in the interstate transportation of healthy and nonexposed cattle or other live stock within or from a quarantined area shall first be cleaned and disinfected as hereinafter provided, unless it shall be shown to the satisfaction of the inspector of the Bureau of Animal Industry either that said cars or other vehicles have been cleaned and disinfected under Regulation 4, and have not carried or contained diseased or exposed animals since that cleaning and disinfection, or that the cars have never been used for the transportation of diseased or exposed animals.

Regulation 6.—Public stock yards, feeding stations, and approaches, chutes, alleys, and pens thereof which have contained diseased or exposed animals shall, before healthy or nonexposed animals for interstate transportation are placed therein, be cleaned and disinfected as hereinafter provided. Failure to clean and disinfect said places will subject them to quarantine.

Regulation 7.—When deemed necessary, interstate shipments of live stock will be stopped in transit for inspection and disposition, and all persons and corporations having control of the transportation of such live stock shall cease the carriage or transit thereof upon receipt of an order from an inspector of the Bureau of Animal Industry, and shall submit the shipment to inspection.

Regulation 8.—When in order to prevent the spread of a disease it becomes necessary to slaughter any diseased or exposed live stock and the purchase of such live stock by the United States is authorized by law and an appropriation is available therefor, the value of the live stock shall be ascertained and compensation made therefor either by agreement with the owner or by appraisement in the manner provided by the law of the State or Territory wherein the owner of the live stock has his legal residence.

Regulation 9.—Where inspection and certification are required by the regulations of the Secretary of Agriculture, inspection and certification by an inspector of the Bureau of Animal Industry are meant, and such inspection and certification will be furnished without the payment of fees or charges of any nature.

Regulation 10.—Interstate shipments of live stock of any quarantined area that are not accompanied by a certificate of an inspector of the Bureau of Animal Industry, showing freedom from disease or from exposure thereto, shall not be diverted en route to feed lots or to other States for feeding, stocking, or breeding purposes unless first inspected and certified by an inspector of the Bureau of Animal Industry.

REGULATIONS TO PREVENT THE SPREAD OF SPLENETIC FEVER OF CATTLE.

Regulation 11.—Whenever any State or Territory located within an area quarantined by the Secretary of Agriculture for splenetic, southern, or Texas fever shall duly establish a State or Territorial quarantined area different from the quarantined area established by the Secretary of Agriculture, and shall obtain the legislation requisite to enforce said State or Territorial quarantine strictly and completely within the boundaries of said State

or Territory, the Secretary of Agriculture will, if the said State or Territorial quarantine be satisfactory, adopt by a rule said State or Territorial quarantine, and the State or Territorial quarantine thus adopted shall define the limits of that portion of the Federal quarantined area, which shall thereafter be known as the modified quarantined area. The expiration of the time fixed in the rule, the revocation of the rule, or a failure upon the part of the State officers to enforce the adopted quarantine shall restore the quarantined area to the territory quarantined by the Secretary of Agriculture before the adoption of the State or Territorial quarantine.

Regulation 12.—Whenever any State or Territory under authority of law shall establish a State or Territorial quarantine for splenetic fever which differs from the quarantine established by the Secretary of Agriculture for the said disease, and shall desire a modification of the area quarantined by the Secretary of Agriculture, the proper officer of the said State or Territory shall forward to the Secretary of Agriculture a true map or description of such State or Territorial quarantine and a duly authenticated copy of the laws and regulations relating to the establishment and enforcement of the quarantine.

Regulation 13.—From the 1st day of February to the 31st day of October, inclusive, of each year no cattle shall be transported or driven or allowed to drift from the modified quarantined area in any State or Territory or the District of Columbia to any point in any other State or Territory or the District of Columbia not included in the modified quarantined area, except as hereinafter provided. During the months of January, November, and December of each year interstate movements of cattle from the modified quarantined area may be made without restrictions other than those imposed by State or Territorial officers at point of destination.

Regulation 14.—Interstate shipments of cattle from the modified quarantined area may be made at any time, by rail or boat, to a recognized slaughtering center for immediate slaughter, but cattle shall not be trailed or driven or hauled in private conveyance from the modified quarantined area in any State or Territory or the District of Columbia to any point in any other State or Territory or the District of Columbia not included in the modified quarantined area. When transported for immediate slaughter, as herein provided, the following rules regarding their movement shall be observed:

(*a*) Cattle of the modified quarantined area which in course of interstate transportation therefrom are unloaded at a point not within the modified quarantined area to be fed or watered, or for other purposes, shall be placed in pens or yards reserved for cattle of the modified quarantined area. Such pens and yards shall be separated from the pens and yards used for cattle that are not of the modified quarantined area as hereinafter provided, and shall be marked with a conspicuous sign bearing the words "QUARANTINE PENS," or "QUARANTINE YARDS," in letters not less than 10 inches in height. If cattle not of the modified quarantined area shall be placed in the said pens or yards, such cattle shall thereafter be treated in all respects as if they were actually of the modified quarantined area. At points of destination, chutes and alleyways and pens, maintained as hereinafter provided and marked with a sign as hereinbefore specified, shall be set apart to receive cattle of the modified quarantined area, and no other cattle shall be admitted to said chutes, pens, and alleyways. The regulations relating to the movement of cattle of the modified quarantined area as prescribed by the proper State officers at destination shall be carefully observed.

(*b*) The cars or boats which have carried cattle of the modified quarantined area shall be cleaned and disinfected as hereinafter provided as soon as possible after unloading and before the said cars or boats are again used in the interstate transportation of live stock or merchandise.

(*c*) Where cattle of the modified quarantined area in course of interstate transportation and cattle not of the modified quarantined area are yarded in adjacent pens, there shall be a space not less than 10 feet wide between the pens, which space shall not be occupied by cattle, and there shall be on each side of this space a tight board fence not less than 5 feet high: *Provided,* That the pens used for cattle of the modified quarantined area shall be inclosed by a tight board fence not less than 6 feet high on the inside.

(*d*) The proper officers of the transportation companies shall securely affix to both sides of all cars carrying interstate shipments of cattle from the modified quarantined area, except as hereinafter provided, durable placards not less than 5½ by 8 inches in size, on which shall be printed with permanent black ink and in bold-face letters not less than 1½ inches in height the words "SOUTHERN CATTLE." These placards shall also show the name of the place from which the shipment was made, the date of the shipment (which must correspond with the date of the waybills and other papers), the name of the transportation company, and the name of the place of destination. Each of the waybills, conductors' manifests, memoranda, and bills of lading pertaining to such shipments by cars or boats shall have the words "SOUTHERN CATTLE" plainly written or stamped upon its face. Whenever such shipments are transferred to another transpor-

tation company or into other cars or into other boats, or are rebilled or reconsigned from any point outside of the modified quarantined area to a point other than the original destination, the cars into which said cattle are transferred and the new waybills, conductors' manifests, memoranda, and bills of lading covering said shipments by cars or boats shall be marked as herein specified for cars carrying said cattle from the modified quarantined area, and for the billing, etc., covering the same. If for any reason the placards required by this regulation are removed from the car or are destroyed or rendered illegible they shall be immediately replaced by the transportation company or its agents, the intention being that legible placards shall be maintained on the car from the time such shipments leave the modified quarantined area until they arrive at destination.

(*e*) No car or boat containing an interstate shipment of cattle of the modified quarantined area shall receive on board cattle which are not of the modified quarantined area. Interstate shipments of cattle of the modified quarantined area shall not be made to points outside of said modified quarantined area where proper facilities have not been provided for transferring the said cattle from the cars or landing to the stock yards and slaughterhouses without passing them over public highways, unless permission for such passing is first had and obtained from the proper authorities at point of destination.

(*f*) The cars and boats used for the interstate transportation of cattle of the modified quarantined area, and also the chutes, alleyways, and pens not reserved for the exclusive use of such cattle used en route and at points of destination, shall be disinfected in the following manner: Remove all litter and manure. This litter and manure may be disinfected by mixing it with lime or saturating it with a 5 per cent solution of pure carbolic acid; or, if not disinfected, it shall be stored where no cattle can come in contact with it during the period from February 1 to October 31, inclusive, of each year. Wash the cars and the watering and feeding troughs with water until clean. Saturate the entire surface of the cars, including the inner surface of the car doors, and the fencing, troughs, chutes, and floors of the pens with a mixture made of 1½ pounds of lime and one-fourth pound of pure carbolic acid to each gallon of water, or with a solution made by dissolving 4 ounces of chloride of lime to each gallon of water.

(*g*) Cars which have carried cattle within the modified quarantined area of any State or Territory or the District of Columbia shall be cleaned and disinfected before being taken to any point in another State or Territory or the District of Columbia not in the modified quarantined area. This provision shall not apply to cars containing cattle in the course of interstate transportation for immediate slaughter, in accordance with these regulations.

Regulation 15.—Cattle infested with the *Boophilus annulatus,* or southern cattle tick, disseminate the contagion of splenetic, southern, or Texas fever; therefore cattle not of the modified quarantined area which are infested with the *Boophilus annulatus* ticks shall be considered as infected cattle and shall be subject to the regulations governing the interstate movement of cattle of the modified quarantined area.

Regulation 16.—Stock-yard companies receiving interstate shipments of cattle infested with the said ticks shall place the said cattle in the pens set aside for the use of cattle of the modified quarantined area, and transportation companies are required to clean and disinfect, in accordance with the requirements of these regulations, all cars and boats used in interstate transportation which have contained the infected cattle.

Regulation 17.—Cattle of the modified quarantined area, or other cattle infested with ticks, which have been properly dipped in Beaumont crude petroleum, or otherwise treated in a manner approved by the Secretary of Agriculture, under the supervision of an inspector of the Bureau of Animal Industry, and which have been examined and certified to be free of infection by the said inspector, may be shipped interstate at any time, subject only to such restrictions as may be imposed by State, Territorial, or District officers at points of destination: *Provided,* That when cattle are to be dipped, as specified herein, they shall, within six hours immediately prior to dipping, be given an opportunity to drink sufficient water to quench their thirst. Shipments of cattle that have been dipped or treated as herein provided shall be forwarded in clean, disinfected cars, shall be accompanied by certificates of dipping or treatment issued by the inspector supervising the same, and shall not be driven through the modified quarantined area or be unloaded therein except at such points as may be designated in the rules of the Secretary of Agriculture.

The interstate movement of horses and mules infested with ticks (*Boophilus annulatus*) may be made only in accordance with the regulations and rule governing the interstate movement of tick-infested cattle.

Regulation 18.—Before accepting or moving an interstate shipment of cattle to a point outside of the quarantined area from that portion of the quarantined area from which under the rules of the Secretary of Agriculture cattle may be shipped after inspection for purposes other than immediate slaughter, transportation companies shall secure a signed

statement from each owner or consignor of said cattle, showing the purpose for which the cattle are shipped. In every case this statement shall accompany the waybills.

REGULATIONS TO PREVENT THE SPREAD OF SCABIES IN CATTLE.

Regulation 19.—Cattle which are diseased with scabies shall not be shipped, trailed, otherwise removed, or allowed to drift from one State, Territory, or the District of Columbia into another State, Territory, or the District of Columbia, except as hereinafter provided; and no cattle shall be shipped, trailed, otherwise removed, or allowed to drift from one State or Territory or portion thereof quarantined for the disease of scabies in cattle into another State, Territory, or the District of Columbia, except as hereinafter provided, unless the said cattle shall have been inspected by an inspector of the Bureau of Animal Industry and found to be free from disease and are accompanied by a certificate from the said inspector.

The removal of cattle unaccompanied by a certificate of inspection from an inspector of the State, Territory, or the District of Columbia, or an inspector of the Bureau of Animal Industry, from a quarantined portion of a State, Territory, or the District of Columbia, into a portion of the same State, Territory, or the District of Columbia not quarantined, will subject the unquarantined portion of the State, Territory, or the District of Columbia to quarantine.

Regulation 20.—In States or Territories or portions thereof quarantined by the Secretary of Agriculture for scabies in cattle, cattle which upon inspection by an inspector of the Bureau of Animal Industry at the time of shipment are found to be free from symptoms of scabies shall be given a certificate and allowed to move interstate for any purpose, subject only to such restrictions as may be imposed by the State, Territorial, or District officers at points of unloading and destination; but if a herd or consignment intended for feeding, breeding, or stocking purposes be offered for inspection and interstate shipment, and a portion thereof is found to be diseased with scabies, or if the cattle offered for inspection and interstate shipment are part of a herd that is known to be so diseased, the diseased cattle offered for such shipment shall be dipped twice in either the lime-and-sulphur or the tobacco-and-sulphur dip, or treated once with Beaumont crude petroleum or similar oil or emulsion thereof in the manner hereinafter provided, and the cattle offered for such shipment which are not visibly diseased shall be dipped once before shipment.

Regulation 21.—Cattle of herds of the quarantined area which are not diseased with scabies may, when accompanied by a permit issued by an inspector of the Bureau of Animal Industry within ten days of the date of shipping, be shipped interstate without inspection as "uninspected clean cattle" to any market or slaughtering center where inspection is maintained, or where facilities are available for dipping, spraying, or slaughtering cattle under the supervision of this Department: *Provided,* That the permits under which such shipments are made shall accompany the billing and be delivered by the transportation company to the inspector at destination at the time of his inspection of the cattle. When so shipped, the cattle shall be submitted for inspection at destination. If found upon such inspection to be free from disease and exposure thereto en route, no further restriction shall be placed upon them, but if found to be infected or to have been exposed they shall not thereafter be permitted interstate shipment until treated as hereinbefore prescribed for diseased or exposed cattle, as the case may be.

Cattle not visibly diseased, but which may be a part of a diseased herd, may, without inspection, be shipped interstate as "uninspected exposed cattle" for immediate slaughter from points in the quarantined area to any recognized slaughtering center where separate pens are provided for yarding exposed cattle; or such cattle may, without inspection, be shipped interstate as "uninspected exposed cattle" for dipping or spraying to points where facilities are maintained for dipping or spraying cattle under the supervision of this Department, and where separate pens are provided for yarding exposed cattle. When "uninspected clean cattle" or "uninspected exposed cattle" are shipped interstate without inspection under the terms of this regulation the proper officers of the transportation company shall affix to both sides of each car carrying such cattle a durable placard not less than 5½ by 8 inches in size, on which shall be printed with permanent black ink in bold-face letters not less than 1½ inches in height the words "UNINSPECTED CLEAN CATTLE" or "UNINSPECTED EXPOSED CATTLE," as the case may be. These placards shall also show the name of the place from which the shipment was made, the date of the shipment (which date must correspond with the date of the waybills and other papers), the name of the transportation company, and the name of the place of destination. Each of the waybills, conductors' manifests, memoranda, and bills of lading pertaining to such shipments by cars or boats shall have the words "UNINSPECTED CLEAN CATTLE" or "UNINSPECTED EXPOSED CATTLE," as the case may be, plainly written or stamped upon its face. Whenever such shipments are transferred to another transportation company or

into other cars or into other boats, or are rebilled or reconsigned to a point other than the original destination, the cars into which said cattle are transferred and the new waybills, conductors' manifests, memoranda, and bills of lading covering such shipments by cars or boats shall be marked as herein specified for cars first carrying said cattle, and for the billing, etc., covering the same. If for any reason the placards required by this regulation are removed from the car or are destroyed or rendered illegible, they shall be immediately replaced by the transportation company or its agents, the intention being that legible placards shall be maintained on the cars from the time of shipment until they arrive at destination, and until the disposition of the cars is indicated by an inspector of the Bureau of Animal Industry.

Regulation 22.—Cattle diseased with scabies which have been dipped once in either the lime-and-sulphur or the tobacco-and-sulphur dip under the supervision of an inspector of the Bureau of Animal Industry within ten days of date of shipment, may be shipped interstate for immediate slaughter to a recognized slaughtering center, and when so shipped the said cattle shall not be diverted en route and shall be slaughtered within two weeks after arrival at destination. If cattle diseased with scabies are to be shipped interstate for stockers or feeders, they shall be dipped twice, ten days apart, under the supervision of an inspector of the Bureau of Animal Industry, in either the lime-and-sulphur or the tobacco-and-sulphur dip; or they shall be either dipped once in, or sprayed once with, a properly prepared emulsion of Beaumont crude petroleum or similar oil under the supervision of such inspector. After dipping or spraying they shall be submitted to inspection before shipment. Cattle not visibly diseased, but which are known to be part of a diseased herd, intended for stockers or feeders, shall be dipped once under the supervision of an inspector of the Bureau of Animal Industry in either the lime-and-sulphur or the tobacco-and-sulphur dip before being shipped interstate; or they shall be either dipped once in, or sprayed once with, a properly prepared emulsion of Beaumont crude petroleum or similar oil under the supervision of an inspector of the Bureau of Animal Industry. However, diseased cattle may be dipped once in either the lime-and-sulphur or the tobacco-and-sulphur dip under the supervision of an inspector of the Bureau of Animal Industry at the point of origin and shipped interstate for stocking or feeding purposes if arrangements have been made for the second dipping en route or at destination at the required time after the first dipping at a point where there is an inspector stationed and under his supervision. Cattle not visibly diseased, but which are known to be part of a diseased herd, shipped to another State or Territory for feeding or stocking purposes, may be dipped or sprayed en route instead of at point of origin by special permission first had and obtained from the Chief of the Bureau of Animal Industry.

Regulation 23.—Healthy cattle in a State or Territory not quarantined by the Secretary of Agriculture for scabies in cattle may be shipped interstate in clean cars, without inspection, for slaughter or for stockers or feeders; but if the said cattle be unloaded en route or at destination and placed in infectious premises, they shall be treated as exposed cattle, and shall not be forwarded to destination for purposes other than for immediate slaughter until they shall have been dipped or sprayed once, under the supervision of an inspector of the Bureau of Animal Industry, in any dip or mixture herein approved.

Regulation 24.—When diseased cattle that have been dipped once in either the lime-and-sulphur or the tobacco-and-sulphur dip, or that have been either dipped once in, or sprayed once with, the petroleum or oil emulsion, or when cattle not visibly diseased but which are known to be a part of a diseased herd, are shipped interstate in accordance with Regulation 22, the proper officers of the transportation company shall affix to both sides of each car carrying such cattle a durable, conspicuous placard, not less than 5½ by 8 inches in size, on which shall be printed with permanent black ink in bold-face letters not less than 1½ inches in height the words "DIPPED SCABBY CATTLE," or CATTLE EXPOSED TO SCABIES," as the case may be. These placards shall also show the name of the place from which the shipment was made, the date of the shipment (which must correspond with the date of the waybills and other papers), the name of the transportation company, and the name of the place of destination. Each of the waybills, conductors' manifests, memoranda, and bills of lading pertaining to such shipments by cars or boats shall have the words "DIPPED SCABBY CATTLE," or "CATTLE EXPOSED TO SCABIES," as the case may be, written or stamped upon its face. Whenever such shipments are transferred to another transportation company or into other cars or into other boats, or are rebilled or reconsigned to a point other than the original destination, the cars into which said cattle are transferred and the new waybills, conductors' manifests, memoranda, and bills of lading covering such shipments by cars or boats shall be marked as herein specified for cars first carrying said cattle and for the billing, etc., covering the same. If for any reason the placards required by this regulation are removed from the car or are destroyed or rendered illegible, they shall be immediately replaced by the transportation company or its agents; the intention being that legible placards shall be maintained on the cars

from the time of shipment until they arrive at destination or point of dipping or spraying, and the disposition of the cars is indicated by an inspector of the Bureau of Animal Industry.

Regulation 25.—The dips now approved by the Department are the lime-and-sulphur dip, the tobacco-and-sulphur dip, and Beaumont crude petroleum. The lime-and-sulphur dip is made in the proportion of 12 pounds of unslaked lime and 24 pounds of flowers of sulphur to 100 gallons of water. The tobacco-and-sulphur dip is made with sufficient extract of tobacco or nicotine solution to give a mixture containing not less than five one-hundredths of 1 per cent of nicotine and 2 per cent flowers of sulphur. Proprietary dips may be used under provisions similar to those set out in Regulation 33. When Beaumont crude petroleum or similar oil or an emulsion thereof is used as a dip or spray for cattle diseased with or exposed to scabies, one dipping or spraying only is necessary. The Department disclaims responsibility for any loss or damage resulting from the dipping or spraying.

Regulation 26.—Cattle shipped interstate under a certificate from an inspector of the Bureau of Animal Industry are not guaranteed uninterrupted transit, for in the event of the discovery of scabies or of exposure thereto en route the cattle shall thereafter be handled as diseased or exposed cattle, as hereinbefore provided, and the cars or other vehicles and the chutes, alleys, and pens which have been occupied by them shall be cleaned and disinfected as hereinafter provided.

Regulation 27.—Public stock yards shall be considered infectious and the cattle yarded therein as having been exposed to the disease, and no cattle shall be removed therefrom to another State, Territory, or the District of Columbia, except for immediate slaughter, without dipping. Where, however, a part or all of the stock yards is reserved and set apart for the reception of uninfected shipments of cattle and is kept free of disease, cattle may be shipped interstate from the uninfectious yards or portions thereof without dipping. If diseased cattle are introduced into the uninfectious yards or portions thereof, they shall be immediately removed therefrom, and the chutes, alleys, and pens used by them thoroughly cleaned and disinfected. No cattle shall be shipped interstate for feeding or stocking purposes from any stock yards where an inspector of the Bureau of Animal Industry is stationed without a certificate of inspection or of dipping or spraying issued by the said inspector.

Regulation 28.—Cars and other vehicles, yards, pens, sheds, chutes, etc., which have contained diseased cattle shall be cleaned and disinfected in the following manner: Remove all the litter and manure and then saturate the interior surfaces of the cars and woodwork, flooring, and ground of the chutes, alleys, and pens, with a 5 per cent solution of pure carbolic acid in water, with sufficient lime to show where it has been applied.

REGULATIONS TO PREVENT THE SPREAD OF SCABIES IN SHEEP.

Regulation 29.—No sheep which are diseased with scabies shall be shipped, trailed, otherwise removed, or allowed to drift from one State, Territory, or the District of Columbia, into another State, Territory, or the District of Columbia, except as hereinafter provided; and no sheep shall be shipped, trailed, otherwise removed, or allowed to drift from a State or Territory or portion thereof quarantined for the disease of scabies in sheep into another State, Territory, or the District of Columbia, except as hereinafter provided, until the sheep shall have been inspected by an inspector of the Bureau of Animal Industry, found to be free from the disease and from exposure thereto, and are accompanied by a certificate from the said inspector. All of the sheep in a certain flock or shipment in which the disease is present shall be classed as diseased sheep, and none of them shall be removed or offered for interstate shipment until dipped as hereinafter provided. The practice of "picking" a flock—i. e., removing sheep which are visibly diseased and then offering any portion of the remaining sheep for either inspection or interstate shipment, or both—is directly and positively prohibited.

Regulation 30.—Healthy sheep in an area not quarantined for the disease of scabies in sheep which have been exposed to the disease may be shipped or trailed interstate without restriction by the regulations of the Secretary of Agriculture to prevent the spread of scabies in sheep; but if said sheep be unloaded en route or at destination and are placed in infectious premises they shall thereafter be treated as exposed sheep and shall not be forwarded to destination for purposes other than immediate slaughter until they shall have been dipped under the supervision of an inspector of the Bureau of Animal Industry.

Regulation 31.—Sheep that are diseased with scabies and that have been dipped once in one of the approved dips, under the supervision of an inspector of the Bureau of Animal Industry within ten days of date of shipment, may be shipped interstate for immediate slaughter to a recognized slaughtering center, and when so shipped the said sheep shall not be diverted en route and shall be slaughtered within two weeks after arrival at destination. If diseased sheep are to be shipped interstate for stocking or feeding

purposes they shall be dipped twice as above indicated, ten days apart, and shall be submitted to inspection before shipment.

Sheep that are not diseased with scabies, but which have been exposed to the contagion of the disease, may be moved interstate for feeding or stocking purposes after one dipping, or they may be shipped interstate by rail or boat to a recognized slaughtering center for immediate slaughter without dipping.

Regulation 32.—When diseased sheep have been dipped once and are shipped interstate for slaughter in accordance with Regulation 31, or when exposed sheep are shipped interstate without dipping for immediate slaughter in accordance with Regulation 31, the proper officers of the transportation company shall affix to both sides of each car a durable placard not less than 5½ by 8 inches in size, on which shall be printed with permanent black ink in bold-face letters not less than 1½ inches in height the words "DIPPED SCABBY SHEEP" or "EXPOSED SHEEP FOR SLAUGHTER," as the case may be. These placards shall also show the name of the place from which the shipment was made, the date of the shipment (which must correspond with the date of the waybills and other papers), the name of the transportation company, and the name of the place of destination. Each of the waybills, conductors' manifests, memoranda, and bills of lading pertaining to such shipments by cars or boats shall have the words "DIPPED SCABBY SHEEP" or "EXPOSED SHEEP FOR SLAUGHTER," as the case may be, written or stamped upon its face. Whenever such shipments are transferred to another transportation company or into other cars or into other boats, or are rebilled or reconsigned to a point other than the original destination the cars into which said sheep are transferred and the new waybills, conductors' manifests, memoranda, and bills of lading covering such shipments by cars or boats shall be marked as herein specified for cars first carrying said sheep and for the billing, etc., covering the same. If for any reason the placards required by this regulation are removed from the car or are destroyed or rendered illegible, they shall be immediately replaced by the transportation company or its agents, the intention being that legible placards shall be maintained on the cars from the time of shipment until they arrive at destination and the disposition of the cars is indicated by an inspector of the Bureau of Animal Industry.

Regulation 33.—The dips now approved are:

(*a*) The tobacco-and-sulphur dip, made with sufficient extract of tobacco or nicotine solution to give a mixture containing not less than five one-hundredths of 1 per cent of nicotine and 2 per cent flowers of sulphur: *Provided,* That for the first dipping of infected sheep, in lieu of the sulphur herein prescribed, a sufficient additional amount of extract of tobacco or nicotine solution shall be used to give a mixture containing not less than seven one-hundredths of 1 per cent of nicotine.

(*b*) The lime-and-sulphur dip, made by mixing 8 pounds of unslaked lime and 24 pounds of flowers of sulphur and boiling with 30 gallons of water for not less than two hours. All sediment should be allowed to subside before the liquid is placed in the dipping vat. This liquid should be diluted sufficiently to make 100 gallons before use;

And pending further investigation, the following-described dips:

(*c*) The cresol dip, which consists of a mixture of cresylic acid [a] with soap. When diluted ready for use this dip should contain one-half of 1 per cent of cresylic acid.

(*d*) The coal-tar creosote dip, which is made by mixing coal-tar creosote or coal-tar oils and cresylic acid separately with resin soap in varying proportions. This dip should contain when diluted ready for use not less than 1 per cent by weight of coal-tar oils and cresylic acid. In no case should the diluted dip contain more than four-tenths of 1 per cent nor less than one-tenth of 1 per cent of cresylic acid; but when the proportion of cresylic acid falls below two-tenths of 1 per cent the coal-tar oils should be increased sufficiently to bring the total of the tar oils and the cresylic acid in the diluted dip up to 1.2 per cent by weight.

The cresol dip and the coal-tar creosote dip should always be tested on a small scale with the water and under the conditions to be employed in dipping in order to avoid possible injury to stock. The diluted sample should be allowed to stand for at least an hour. If after this length of time there is a separation of an oily layer the dip should not be used with that kind of water. Especial care in this connection is necessary where hard water is to be used.

In the undiluted coal-tar creosote dips there may be, in cold weather especially, a separation of naphthalene and other constituents of the dip. Care should therefore be taken to see that the concentrated dip is homogeneous in character before using any portion of it.

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[a] By the term cresylic acid as used in these regulations is meant cresols and other phenols derived from coal tar, none of which boils below 185° C. nor above 250° C.

Manufacturers who desire the Department to approve their dips for official dipping should submit a sample of their product to the Bureau of Animal Industry in Washington and accompany this with the formula used in preparing the dip.

Before a proprietary substance is approved for use in official dipping the manufacturer must agree as follows:

(1) To recommend for sheep scab a dilution of his product which is approved by the Department of Agriculture.

(2) To maintain his product of uniform composition.

(3) To place on packages of dips which have been approved the following statement:

A sample of this product has been submitted to the Department of Agriculture for examination. We guarantee the contents of this package to be of the same composition as the sample submitted to the Department, and that when diluted according to the directions printed hereon for the treatment of sheep scab it will give a dipping fluid of the composition required of a ———[a] dip by the regulations of the Secretary of Agriculture governing sheep scab.

(4) To have on containers or advertising matter no reference to the United States Government or any of its Departments except as provided in the preceding paragraph.

Regulation 34.—The dipping shall be done carefully and the sheep handled as humanely as possible. The Department disclaims responsibility for any loss or damage resulting from the dipping, and those who wish to avoid any risks that may be incident to dipping at the stock yards, as well as to avoid liability to prosecution, should see that their sheep are free from disease before shipping them to market.

Regulation 35.—Sheep shipped interstate under a certificate from an inspector of the Bureau of Animal Industry are not guaranteed uninterrupted transit; for in the event of the discovery of scabies or of exposure thereto en route the sheep shall thereafter be handled as diseased or exposed sheep, as hereinbefore provided, and the cars or other vehicles and the chutes, alleys, and pens which have been occupied by them shall be cleaned and disinfected, as hereinafter provided.

Regulation 36.—Public stock yards shall be considered infectious and the sheep yarded therein as having been exposed to the disease, and no sheep shall be shipped interstate therefrom, except for immediate slaughter, without dipping. Where, however, a part or all of the stock yards is reserved and set apart for the reception of uninfected shipments of sheep and is kept free of disease, sheep may be shipped interstate from the uninfectious yards or portions thereof without dipping. If diseased sheep are introduced into the uninfectious yards or portions thereof, they shall be immediately removed therefrom and the chutes, alleys, and pens occupied by the said sheep shall be thoroughly cleaned and disinfected. No sheep shall be shipped interstate for feeding or stocking purposes from any stock yards where an inspector of the Bureau of Animal Industry is stationed without a certificate of inspection or of dipping issued by the said inspector.

Regulation 37.—Cars and other vehicles, yards, pens, sheds, chutes, etc., that have contained diseased sheep shall be cleaned and disinfected in the following manner: Remove all litter and manure and then saturate the interior surfaces of the cars and the woodwork, flooring, and ground of the sheds, alleyways, and pens with a solution containing 5 per cent of pure carbolic acid or with a solution containing 2 per cent of cresol. When cresol is used it must be mixed with soft soap in order to render it easily soluble in cold water. Cars and premises are not required to be cleaned and disinfected on account of their having contained "dipped scabby sheep" that have been dipped within ten days or sheep that have been exposed to scabies. In determining exposure, all sheep in a flock or shipment in which disease is present shall be classed as diseased.

REGULATIONS TO PREVENT THE SPREAD OF MALADIE DU COÏT.

Regulation 38.—No horses or asses shall be offered for interstate shipment, shipped, transported, driven, or trailed, or otherwise removed or allowed to drift interstate from an area quarantined by the Secretary of Agriculture for maladie du coït, without inspection and certification of freedom from the disease for the purpose of the particular movement by an inspector of the Bureau of Animal Industry. Owners and custodians of horses or asses for whom inspection is made shall provide such reasonable facilities and render such assistance as may be required by the inspector.

Regulation 39.—If stallions or jacks shall be allowed to run at large in an area quarantined by the Secretary of Agriculture for maladie du coït, or if there shall be any

[a] There should be inserted here the name of the class of dips to which the product belongs, such as "cresol" or "lime and sulphur," etc.

breeding of horses or asses in a herd in an area quarantined by the Secretary of Agriculture for maladie du coït in which there is a horse or an ass which has been exposed to the infection of maladie du coït within eighteen months after the said exposure, a rule will be issued forbidding absolutely the interstate movement of any horses or asses from the said area.

Regulation 40.—When it is necessary in order to prevent the spread of the disease and to aid in its extermination, and an appropriation is available therefor, the Department of Agriculture will purchase a diseased or exposed animal at a price based upon its actual value for work purposes at the time of purchase. When, however, the owner or owners will not accept the indemnity price offered by the Department, the inspector shall arrange for a board of three appraisers, who shall determine the price to be paid for the condemned animal. This board shall be constituted as follows: An inspector or other employee of the Bureau of Animal Industry, one person chosen by the owner of the animal or animals to be appraised, and the third member to be chosen by the two herein provided for.

Regulation 41.—The Department will pay the sum of $50 for authentic information leading to the discovery of the ownership and location of a stallion or a jack affected with the contagious venereal disease known as maladie du coït, and the sum of $25 for authentic information leading to the discovery of the ownership and location of a female animal affected with the disease: *Provided,* That when such information is received from more than one person as to the location of the same animal and owner, the sum above named shall be paid to the first informant, and when doubt exists or a dispute arises as to who was the first informant, no reward shall be paid. When more than one diseased animal is found belonging to the same owner or on the same premises only one reward shall be paid.

REGULATIONS TO PREVENT THE SPREAD OF HOG CHOLERA AND SWINE PLAGUE.

Regulation 42.—No swine which are diseased with hog cholera or swine plague, or which have been exposed to either of the diseases by contact with diseased animals or by confinement in infectious cars, pens, or other premises, shall be transported, trailed, or driven from one State or Territory or the District of Columbia, into another State or Territory or the District of Columbia, except as hereinafter provided. All persons intending to ship swine interstate shall ascertain before offering them for such shipment that the animals are not diseased and have not been exposed to the contagion of either disease.

Regulation 43.—Swine which are not diseased with hog cholera or swine plague and which have not been exposed to the infection thereof may be shipped from one State or Territory or the District of Columbia into another State or Territory or the District of Columbia without restriction by the regulations of the Secretary of Agriculture and subject only to such restrictions as may be imposed on the shipment by State or Territorial or District of Columbia officers at destination.

Regulation 44.—Public stock yards shall be considered infectious, and no interstate movement of swine therefrom shall be made for feeding or stocking purposes. Diseased swine shall not be shipped interstate from the stock yards, but shall be slaughtered, subject to condemnation on post-mortem inspection; and all swine in a certain lot or shipment shall be classed as diseased when one or more of them show evidence of the disease. Swine that are not diseased and have been merely exposed by being in the yards may be shipped interstate to a recognized slaughtering center for immediate slaughter. Where, however, a part of the yard is set apart for the reception of uninfected shipments of swine and is kept free of infection, swine may be shipped interstate from the uninfectious portions thereof without restriction. Should such part be contaminated by the introduction of diseased swine, said animals shall be immediately removed therefrom, and the chutes, alleys, and pens occupied by them thoroughly cleaned and disinfected as hereinafter provided.

Regulation 45.—Cars and other vehicles and pens or yards which have contained interstate shipments of diseased or exposed swine shall be cleaned and disinfected as soon as possible after unloading. Cars that have contained interstate shipments of swine shall not be removed until the inspector has ascertained the condition of the live animals and either released the cars or given notice that they shall be cleaned and disinfected. Cleaning and disinfection shall be done by first removing all litter and manure and then saturating the interior surfaces of the cars and the woodwork, flooring, and ground of the chutes, alleys, and pens with a 5 per cent solution of pure carbolic acid in water, or with a solution containing 2 per cent of cresol. When cresol is used it must be mixed with soft soap in order to render it easily soluble in water.

(B. A. I. ORDER NO. 144.)

Rule 1, Revision 2.—To Prevent the Spread of Splenetic Fever in Cattle (Effective on and after April 15, 1907).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The fact has been determined by the Secretary of Agriculture, and notice is hereby given, that a contagious and infectious disease, known as splenetic, southern, or Texas fever, exists among cattle in the following-named States and Territories, to wit:

CALIFORNIA, OKLAHOMA, INDIAN TERRITORY, TEXAS, ARKANSAS, LOUISIANA, MISSISSIPPI, TENNESSEE, ALABAMA, VIRGINIA, NORTH CAROLINA, SOUTH CAROLINA, GEORGIA, and FLORIDA.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, under authority conferred by section 1 of the act of Congress approved March 3, 1905 (33 Stat., 1264), do hereby quarantine the following area, to wit:

All territory situate within the boundaries of California, Oklahoma, Indian Territory, Texas, Arkansas, Louisiana, Mississippi, Alabama, Tennessee, Virginia, North Carolina, South Carolina, Georgia, and Florida.

It is ordered by this Rule 1, Revision 2, under the authority and discretion conferred on the Secretary of Agriculture by section 3 of the act of Congress approved March 3, 1905 (33 Stat., 1265), that the interstate movement of cattle of the area herein quarantined to any point not located in the said quarantined area shall only be made in accordance with the regulations of the Secretary of Agriculture designated as B. A. I. Order No. 143, promulgated March 22, 1907, and effective April 15, 1907, subject to the following exceptions, to wit:

Exception 1.—The States of California, Texas, Tennessee, Georgia, North Carolina, and Virginia and the Territory of Oklahoma, having fixed quarantined areas within their respective boundaries which differ from the quarantined area fixed by the Secretary of Agriculture, and having enacted laws necessary to enforce the quarantine of such areas, the said State and Territorial quarantined areas, which are limited by the line described below, are hereby adopted to continue as provided in Regulation 11 of the Regulations of the Secretary of Agriculture promulgated March 22, 1907, and effective April 15, 1907. Except as hereinafter provided in Exceptions 3, 4, and 7, the area hereinbefore quarantined is modified accordingly.

The following is a description of the line which modifies the quarantined area and fixes the limits of the modified quarantined area:

CALIFORNIA.

Beginning on the Pacific coast where the northern boundary of San Luis Obispo County connects with the Pacific Ocean; thence easterly along the northern boundary of San Luis Obispo County to its junction with the western boundary of Kings County; thence northwesterly along the western boundary of Kings and Fresno counties to the northwest corner of Fresno County; thence northeasterly along the southern boundary of Merced County to its intersection with the right of way of the main line of the Southern Pacific Company; thence southeasterly along the right of way of the main line of the Southern Pacific Company to its intersection with the southern boundary of Fresno County; thence northeasterly along the southern boundary of Fresno County to the northeast corner of Tulare County; thence southerly along the eastern boundary of Tulare County to the southeast corner of said county; thence easterly along the southern boundary of Inyo County to its intersection with the eastern boundary of the State of California.

TEXAS.

Beginning at the intersection of the southern boundary of New Mexico with the international boundary at the Rio Grande River; thence following along the said international boundary to the southwest corner of the county of Terrell; thence northwesterly along the boundaries of Terrell and Pecos counties to a point where the roadbed of the Galveston, Harrisburg and San Antonio Railroad Company crosses the western boundary of Pecos County; thence in an easterly direction with the center of said roadbed to a point on Section No. 36, Block A2, Galveston, Harrisburg and San Antonio Railroad Company; thence north with the pasture fence, running in a northerly direction through the eastern part of Sections Nos. 13 and 12 of said Block A2 and across Section 1, Gulf, Colorado and Santa Fe Railway Company; thence continuing north with said pasture fence through the eastern parts of Sections Nos. 16, 17, 46, 47, 76, 77, 106, 107,

136, 137, 142, 143, and 194, Block D, Missouri, Kansas and Texas Extension Railway Company; thence continuing in a northerly direction to a point on the northern boundary of Section No. 6, Block 160, Gulf, Colorado and Santa Fe Railway Company, same being corner of pasture fence; thence east along the northern boundary of Sections Nos. 6, 9, 10, 11, 12, 15, 16, Block 160, Gulf, Colorado and Santa Fe Railway Company, to the northeast corner of said Section No. 16, the same being corner of pasture fence; thence in a northerly direction with the eastern boundary of Sections Nos. 22, 21, 20, 23, 24, 25, 26, 27, 28, 29, 30, 31, and 32, Block 1, Corpus Christi, San Diego and Rio Grande Narrow Gauge Railway Company, to the northeast corner of said Section No. 32; thence west with the northern boundary of Sections Nos. 32 and 33, same block, to the northwest corner of Section No. 33, Block 1, Corpus Christi, San Diego and Rio Grande Narrow Gauge Railway Company, corner of fence; thence north with the eastern boundary of Sections Nos. 1, 12, 13, 24, 25, 36, 37, 48, 49, 60, 61, and 72, Block 2, Corpus Christi, San Diego and Rio Grande Narrow Gauge Railway Company to the northeast corner of said Section No. 72; thence in an easterly direction with the pasture fence to the southeast corner of Section No. 9, patented to James E. Evans; thence north along the eastern boundary of said Section No. 9 to the northwest corner of Section No. 100, Block A2, Texas Central Railway Company; thence east with the northern boundary of Sections Nos. 100 and 89, same block, to the northeast corner of said Section No. 89, Block A2, Texas Central Railway Company; thence north along the eastern boundary of Sections Nos. 90, 91, 92, and 93 to the southeast corner of Section No. 94, Block A2, Texas Central Railway Company; thence northwest diagonally across Section No. 94 to the northwest corner of said section; thence continuing in a northwesterly direction diagonally across Sections Nos. 14, 18, and 28 to the northeast corner of Section No. 29, Block C4, Gulf, Colorado and Santa Fe Railway Company; thence west with the northern boundary of said Section No. 29 to the northwest corner of said section; thence northwest diagonally across Section No. 1, Texas Central Railway Company, Section No. 97, Block 194, Gulf, Colorado and Santa Fe Railway Company, to the northeast corner of Section No. 96; thence in a northerly direction across Section No. 94 to a point on its northern boundary 600 varas west of its northeast corner; thence continuing north through Sections Nos. 93, 90, 89, 86, 85, and 58, Block 194, Gulf, Colorado and Santa Fe Railway Company, to a point on the northern boundary of said Section No. 58; thence northwesterly with the pasture fence through Section No. 59 to the northeast corner of Section No. 82 and the southeast corner of Section No. 81, same block; thence continuing northwesterly to Section No. 17, Houston and Great Northern Railroad Company; thence north along the eastern boundary of said Section 17 to the Pecos River; thence northwesterly along said Pecos River to the northwest corner of Crockett County; thence east along the northern boundary of Crockett and Schleicher counties to the southeast corner of Irion County; thence north along the eastern boundary of Irion County to the northeast corner of said county; thence continuing due north to the southern boundary of Coke County; thence west along the southern boundary of Coke County to the southwest corner of Coke County; thence north along the western boundary of Coke County to the southern boundary of Mitchell County; thence east to the southeast corner of Mitchell County; thence north along the eastern boundary of Mitchell County to the northeast corner of said county; thence east along the southern boundaries of Fisher and Jones counties to the southeast corner of Jones County; thence north along the eastern boundary of Jones County to the northeast corner of said county; thence east along the southern boundary or Haskell County to the southeast corner of said county; thence north along the western boundaries of Throckmorton and Baylor counties to the northwest corner of Baylor County; thence east along the southern boundary of Wilbarger County to the southeast corner of said county; thence north along the eastern boundary of Wilbarger County to the Red River; thence continuing in a northwesterly direction along the course of said river and the northern boundary of Texas to the southwest corner of Greer County, Okla.; thence north, following the eastern boundary of Texas to the northwest corner of said Greer County.

OKLAHOMA.

Beginning on the Red River at the northwest corner of Wichita County, Tex.; thence northwesterly along the course of said river to the southwest corner of Greer County; thence north along the western boundary of Greer County to the northwest corner thereof; thence easterly and southerly along the southern boundary of Roger Mills County to the southeast corner of said county; thence east along the southern boundary of Washita County to the southeast corner of said county; thence north along the eastern boundaries of Washita and Custer counties to the Canadian River; thence in a southeasterly direction along the course of said river to the southeast corner of Canadian County; thence north along the eastern boundary of Canadian County to the northwest corner of Cleveland County; thence east along the northern boundary of Cleveland County to the middle

of the right of way of the Atchison, Topeka and Santa Fe Railway; thence northerly, following the middle of said right of way, through Oklahoma, Logan, Noble, and Payne counties and the Otoe and Missouria and Ponca Indian reservations to the northern boundary of the Ponca Indian Reservation; thence east along the northern boundary of the Ponca Indian Reservation to the Arkansas River; thence in a northerly direction following the course of the said river to its intersection with the thirty-seventh parallel of north latitude at the southern boundary of Kansas.

TENNESSEE.

Beginning on the Mississippi River at the southeast corner of the State of Missouri at the western boundary of Tennessee; thence southerly along the western boundaries of the counties of Dyer and Lauderdale; thence following the main channel of the Mississippi River (leaving Island No. 37 to the north and west) to the northwest corner of Shelby County, on the Mississippi River; thence east along the northern boundary of Shelby County to the northeast corner thereof; thence southerly along the eastern boundary of Shelby County to its intersection with the Nashville, Chattanooga and St. Louis Railway; thence northeasterly along the Nashville, Chattanooga and St. Louis Railway to the town of Somerville; thence northerly along the Somerville and Brownsville wagon road to the northern boundary of Fayette County; thence easterly along the northern boundary of Fayette County to the northeast corner thereof; thence northerly and easterly along the western and northern boundaries of Hardeman County to the Illinois Central Railroad; thence along the Illinois Central Railroad to the corporate limits of the city of Jackson; thence westerly and northerly along the corporate limits of the city of Jackson to the Jackson and Spring Creek public road; thence northerly along the Jackson and Spring Creek public road to its intersection with the southern boundary of Carroll County; thence westerly, northerly, and easterly along the southern, western, and northern boundaries of Carroll County to the northeast corner thereof; thence northerly along the eastern boundary of Henry County to its intersection with the Louisville and Nashville Railroad; thence easterly along the Louisville and Nashville Railroad through Benton County to the Tennessee River; thence southerly along the eastern boundaries of Benton and Decatur counties to the northwest corner of Wayne County; thence easterly along the northern boundary of Wayne County to the southeast corner of Perry County; thence northerly, easterly, and southerly along the western, northern, and eastern boundaries of Lewis County to the northern boundary of Lawrence County; thence easterly along the northern boundary of Lawrence County to the northeast corner thereof; thence southerly along the eastern boundary of Lawrence County to the southeast corner thereof; thence east along the southern boundary of Giles County to the Elk River; thence northeasterly along said river to the point in Franklin County where Big Hurricane Creek empties into said Elk River; thence northerly and westerly along Big Hurricane Creek to the eastern boundary of Moore County; thence northerly along the eastern boundaries of Moore and Bedford counties to Duck River; thence easterly along Duck River to the Manchester and Woodbury public road; thence northeasterly along the Manchester and Woodbury public road to the southern boundary of Cannon County; thence easterly, northeasterly, and northwesterly along the southern, eastern, and northeastern boundaries of Cannon County to the west prong of Dry Creek near the southeast corner of the third civil district of Dekalb County; thence northerly along said creek to its intersection with the southern boundary of the twentieth civil district of said county; thence easterly and northerly along the southern and eastern boundaries of said twentieth civil district to the southern boundary of the tenth civil district of said county near Capling; thence southeasterly along the southern boundary of the tenth and twenty-second civil districts of said county to Big Hurricane (or Harrison) Creek; thence northerly along said creek to Caney Fork River; thence northwesterly along Caney Fork River to the eastern boundary of the eighteenth civil district of said Dekalb County; thence northerly along the eastern boundary of said eighteenth civil district to the southern boundary of Putnam County; thence northerly along the eastern boundaries of the ninth, eleventh, and tenth civil districts of Putnam County to the southern boundary of Jackson County; thence easterly and northerly along the southern and eastern boundaries of Jackson and Clay counties to the northwest corner of Pickett County; thence easterly along the northern boundary of Pickett County to the northwest corner of Scott County; thence southerly, westerly, and southwesterly along the eastern and southern boundaries of Pickett County to the Obey River; thence southeasterly, southerly, and southwesterly along the Obey River and the East Fork Obey River to the point where the East Fork Obey River intersects the western boundary of Fentress County; thence southerly and easterly along the western and southern boundaries of Fentress County to the northern boundary of Cumberland County; thence westerly and southerly along the northern and western boundaries of Cumberland County to the northwest corner of Bledsoe County; thence easterly, northeasterly, and southeasterly along the boundary of Cumberland County to the southwest

corner of Roane County; thence northeasterly, southeasterly, and southwesterly along the western, northern, and eastern boundaries of Roane County to the Tennessee River; thence following the Tennessee River to the southeast corner of Rhea County; thence southeasterly along the northern boundary of James County to its intersection with the western boundary of Bradley County; thence northerly and easterly along the western boundary of Bradley County and the northern boundaries of Bradley and Polk counties to the northeast corner of Polk County; thence southerly along the eastern boundary of Polk County to the southeast corner thereof at the State line.

GEORGIA.

Beginning at the intersection of the western boundary of Union County with the boundary between the States of Georgia and North Carolina; thence southerly along the western boundary of Union County to the southwest corner thereof; thence northeasterly and easterly along the southern boundaries of Union and Towns counties to the western corner of Rabun County; thence easterly, southeasterly, and northeasterly along the western, southern, and eastern boundaries of Rabun County to the northeast corner of said county, on the boundary between Georgia and North Carolina.

NORTH CAROLINA.

Beginning on the boundary between North Carolina and Tennessee, at the northwest corner of Cherokee County; thence southerly along the western boundary of said county to the southwest corner thereof; thence following the State line easterly along the southern boundaries of the counties of Cherokee, Clay, Macon, Jackson, Transylvania, Henderson, Polk, Rutherford, Cleveland, Gaston, and Mecklenburg to the western corner of Union County; thence northeasterly along the western boundaries of Union and Stanly counties to the northwest corner of Stanly County; thence easterly along the southern boundaries of Rowan and Davidson counties to the southeast corner of Davidson County; thence northerly along the eastern boundaries of Davidson and Forsyth counties to the northeast corner of Forsyth County; thence westerly and northerly along the southern and western boundaries of Stokes County to the northwest corner thereof at the State line; thence westerly along the northern boundary of the State of North Carolina to the southwest corner of Patrick County, Va.

VIRGINIA.

Beginning at the boundary of Virginia at its southwest corner (Lee County); thence east along the southern boundary of Virginia to the southwest corner of Patrick County; thence northerly and easterly along the western boundary of Patrick County to the northernmost point of said county; thence easterly and northerly along the southern and eastern boundaries of Franklin County to the northeast corner of said county; thence easterly along the northern boundaries of Pittsylvania and Halifax counties to the southeast corner of Campbell County; thence northerly along the eastern boundary of Campbell County to its intersection with the southern boundary of Appomattox County; thence easterly and southeasterly along the southern boundaries of Appomattox, Prince Edward, and Nottoway counties to the southeast corner of Nottoway County; thence northerly, easterly, westerly, and northeasterly along the eastern boundaries of Nottoway, Amelia, and Powhatan counties to the James River; thence following the James River to the southeast corner of Charles City County; thence northerly and easterly along the western and northern boundaries of James City County to the York River; thence southeasterly along the boundaries of James City and York counties to the northeast corner of Elizabeth City County; thence westerly, northwesterly, and southerly along the boundaries of Elizabeth City and Warwick counties to the James River; thence southeasterly along the course of the said river to the northwest corner of Norfolk County; thence southerly along the western boundary of said county to its intersection with the northern boundary of North Carolina; thence east along the southern boundaries of Norfolk and Princess Anne counties to the Atlantic Ocean.

Exception 2—California.—The island of Santa Rosa, a part of Santa Barbara County, on account of being free from Texas fever infection and being separated from the mainland, is not to be regarded as a part of the modified quarantined area. During the continuance of the quarantine as herein established and modified no cattle of the modified quarantined area of any State or Territory other than California shall be moved or allowed to move into the counties of Santa Barbara, San Luis Obispo, Kern, Kings, Tulare, and those portions of Madera and Fresno counties located west of the main line of the Southern Pacific Company.

No cattle of the counties of Santa Barbara (except the island of Santa Rosa), San Luis Obispo, Kern, Kings, Tulare, and those portions of Madera and Fresno counties located west of the main line of the Southern Pacific Company shall be moved or allowed to move, except as provided for immediate slaughter, to any point in the United States, not in the State of California, which is located outside of the modified quarantined area, until the said cattle shall have been inspected and found free of infection and a written permit for the shipment issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 3—Texas.—During the continuance of the quarantine as herein established and modified no cattle of the modified quarantined area of any State or Territory other than Texas shall be moved or allowed to move into the counties of Baylor and Throckmorton.

No cattle of the counties of Childress, Cottle, Hardeman, Foard, Wilbarger, King, Knox, Haskell, Stonewall, Jones, Fisher, Scurry, Borden, Howard, Mitchell, Glasscock, Sterling, Irion, Reagan, Upton, Crane, Throckmorton, Baylor, and those portions of Pecos, Terrell, and Tom Green counties lying north and west of the quarantine line described in Exception 1, shall be moved or allowed to move, except as provided for immediate slaughter, to any point in the United States, not in the State of Texas, which is located outside of the modified quarantined area, until the said cattle shall have been inspected and found free of infection and a written permit for the shipment issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 4—Oklahoma.—During the continuance of the quarantine as herein established and modified no cattle of the modified quarantined area of any State or Territory other than Oklahoma shall be moved or allowed to move, except as hereinafter provided, into the counties of Greer, Cleveland, Pottawatomie, Lincoln, Pawnee, those portions of Blaine and Canadian counties south of the Canadian River, that portion of Caddo County north of the right of way of the Chicago, Rock Island and Pacific Railway, and that portion of Kiowa County lying north of Comanche County and the line between townships 4 and 5 north, extended westward to its intersection with the North Fork of the Red River, those portions of the counties of Oklahoma, Logan, Payne, and Noble lying east of the right of way of the Atchison, Topeka and Santa Fe Railway, or into the Kansas Nation or Osage Nation: *Provided,* That from October 1 of each year to May 15 of the following year cattle of the modified quarantined area of any other State or Territory may be moved into the above-mentioned counties, parts of counties, and nations, after having been satisfactorily dipped in Beaumont crude petroleum, or otherwise properly treated, under the supervision of an inspector of the Bureau of Animal Industry.

No cattle of the counties of Greer, Oklahoma, Logan, Payne, Cleveland, Pottawatomie, Lincoln, Pawnee, Canadian, that portion of Noble County included in the Otoe and Missouria and Ponca Indian reservations, and that portion of Noble County bounded on the north by the Otoe and Missouria Indian Reservation, on the east by Pawnee County, on the south by Payne County, and on the west by the right of way of the Atchison, Topeka and Santa Fe Railway, that portion of Blaine County south of the Canadian River, that portion of Caddo County north of the right of way of the Chicago, Rock Island and Pacific Railway, that portion of Kiowa County lying north of Comanche County and the line between townships 4 and 5 north, extended westward to its intersection with the North Fork of the Red River, or in the Kansas Nation or Osage Nation, shall be moved or allowed to move, except as provided for immediate slaughter, to any point in the United States, not in the Territory of Oklahoma, which is located outside of the modified quarantined area, until the said cattle shall have been inspected and found free of infection and a written permit for the shipment issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 5—Tennessee.—During the continuance of the quarantine as herein established and modified no cattle of the modified quarantined area of any State or Territory other than Tennessee shall be moved or allowed to move into that portion of Lincoln County south of the Elk River and that portion of Coffee County south of Duck River and east of the Manchester and Woodbury public road.

No cattle of that portion of Lincoln County south of the Elk River and that portion of Coffee County south of Duck River and east of the Manchester and Woodbury public road shall be moved or allowed to move, except as provided for immediate slaughter, to any point in the United States, not in the State of Tennessee, which is located outside of the modified quarantined area, until the said cattle shall have been inspected and found free of infection and a written permit for the shipment issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of

the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 6—Georgia.—During the continuance of the quarantine as herein established and modified no cattle of the modified quarantined area of any State or Territory other than the State of Georgia shall be moved or allowed to move into the counties of White, Stephens, and Habersham.

No cattle of the counties of White, Stephens, and Habersham shall be moved or allowed to move, except as provided for immediate slaughter, to any point in the United States, not in the State of Georgia, which is located outside of the modified quarantined area, until the said cattle shall have been inspected and found free of infection and a written permit for the shipment issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 7—North Carolina.—That portion of the line described in Exception 1 limiting the modified quarantined area of the State of North Carolina beginning at the intersection of the northwest corner of Union County, Ga., with the North Carolina State line and extending easterly along the southern boundary line of North Carolina to the northeast corner of Rabun County, Ga., is hereby suspended during the enforcement of the quarantine as established by the State of Georgia.

During the continuance of the quarantine as herein established and modified no cattle of the modified quarantined area of any State or Territory other than North Carolina shall be moved or allowed to move into the counties of Union, Anson, Stanly, Stokes, Rockingham, Guilford, Caswell, Alamance, Person, Orange, Durham, Granville, Vance, Warren, and Franklin.

No cattle of the counties of Union, Anson, Stanly, Stokes, Rockingham, Guilford, Caswell, Alamance, Person, Orange, Durham, Granville, Vance, Warren, Franklin, Yadkin, Cleveland, Rutherford, that part of McDowell County south and east of the Catawba River, Crooked Creek, and the eastern boundary of Crooked Creek Township, that part of Davidson County south of the main line of the Southern Railway and east of Abbotts Creek, and that part of Rowan County included in Morgan and Providence townships, shall be moved or allowed to move, except as provided for immediate slaughter, to any point in the United States, not in the State of North Carolina, which is located outside of the modified quarantined area, until the said cattle shall have been inspected and found free of infection and a written permit for the shipment issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 8—Virginia.—That portion of the line described in Exception 1 limiting the modified quarantined area of the State of Virginia beginning at the southwest corner of Virginia (Lee County) and extending east along the southern boundary line of Virginia to the southwest corner of Patrick County, Va., is hereby suspended during the enforcement of the quarantine as established by the States of Tennessee and North Carolina.

During the continuance of the quarantine as herein established and modified no cattle of the modified quarantined area of any State or Territory other than Virginia shall be moved or allowed to move into the counties of Patrick, Henry, Pittsylvania, Halifax, Charlotte, Mecklenburg, Lunenburg, and Brunswick.

No cattle of the counties of Patrick, Henry, Pittsylvania, Halifax, Charlotte, Mecklenburg, Lunenburg, and Brunswick shall be moved or allowed to move, except as provided for immediate slaughter, to any point in the United States, not in the State of Virginia, which is located outside of the modified quarantined area, until the said cattle shall have been inspected and found free of infection and a written permit for the shipment issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 9—Arkansas.—During the months of January, February, and March of each year cattle may, after inspection and certification of freedom from ticks (*Boophilus annulatus*) by an inspector of the Bureau of Animal Industry, be moved from the counties of Benton, Washington, Carroll, Madison, Boone, Newton, Marion, Searcy, Baxter, Fulton, Izard, Stone, Sharp, Independence, Randolph, Lawrence, Clay, and Greene to points in the United States, not in Arkansas, located outside of the modified quarantined area, for feeding and stocking purposes, subject to the following restrictions, to wit: The cattle shall have been continuously in said counties for not less than thirty days immediately next preceding the date of inspection. Proper facilities shall be afforded for making such inspection. After inspection said cattle shall be moved immediately, without exposure to the infection of splenetic or Texas fever, direct to pastures or feed lots, without dividing the herd or shipment. The cattle shall be kept continuously in the State into which they are moved for at least three months after arrival. Permis-

sion shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be forwarded.

No cattle of said counties shall be moved or allowed to move, except as provided for immediate slaughter, to any point located outside of the modified quarantined area in any State or Territory other than Arkansas, unless accompanied by a written permit for the movement from an inspector of the Bureau of Animal Industry.

Exception 10—Indian Territory.—During the continuance of the quarantine as herein established and modified no cattle of the modified quarantined area of any State or Territory other than Indian Territory shall be moved or allowed to move, except as hereinafter provided, into Registration Districts Nos. 1, 2, 3, 4, and 5, being that portion of Cherokee Nation bounded on the south by the northern boundary of the Creek Nation and a line extended from the northeast corner of said Creek Nation due east to the Arkansas State line: *Provided,* That from October 1 of each year to May 15 of the following year cattle of the modified quarantined area of any State or Territory other than Indian Territory may be moved into the above-mentioned registration districts (Nos. 1, 2, 3, 4, and 5) after having been satisfactorily dipped in Beaumont crude petroleum, or otherwise properly treated, under the supervision of an inspector of the Bureau of Animal Industry.

No cattle of said registration districts shall be moved or allowed to move, except as provided for immediate slaughter, to any point in the United States, not in Indian Territory, which is located outside of the modified quarantined area, until the said cattle shall have been inspected and found free of infection and a written permit for the movement issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 11—Open Season.—During the months of January, November, and December of each year cattle of the modified quarantined area of any State or Territory shall not be moved interstate therefrom for purposes other than immediate slaughter into the States of Missouri and Kansas, the Territories of Arizona and New Mexico, and those portions of California, Texas, Tennessee, and Georgia not included in the modified quarantined area until the said cattle shall have been inspected and found free of infection and a written permit for the movement issued by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the State or Territory to which the cattle are destined, nor until permission shall have been obtained from the proper official of the said State or Territory. During the months of January and February, the first fifteen days of March, and the last sixteen days of December in each year cattle of the modified quarantined area of any State or Territory may be moved interstate under the above-mentioned restrictions into those portions of the States of Virginia and North Carolina not included in the modified quarantined area. During the months of January and December in each year cattle of the modified quarantined area of any State or Territory may be moved interstate under the above-mentioned restrictions into that portion of Oklahoma not included in the modified quarantined area.

Cattle of the modified quarantined area that have been shipped interstate to a point in any State or Territory outside of the modified quarantined area, other than those States and Territories and portions thereof set out in this exception, shall not be moved into any of the States or Territories or portions thereof hereinbefore set out in this exception within three months of the date of the movement from the modified quarantined area.

Cattle which are moved interstate from the modified quarantined area of any State or Territory into those States or Territories or portions thereof hereinbefore set out in this exception, under certificates from inspectors either of the Bureau of Animal Industry or of the States or Territories to which the cattle are destined for feeding or stocking purposes, shall not be placed in stock pens which have been reserved for cattle originating in the modified quarantined area.

FEEDING STATIONS.

Cattle not of the modified quarantined area, which are transported interstate by rail through the modified quarantined area, may be unloaded for rest, feed, and water into noninfectious pens set apart for such cattle at Polk Stock Yards and Union Stock Yards at Fort Worth, Tex.; the stock yards at Baird, Tex.; the stock yards of the International and Great Northern Railroad at Laredo, Tex.; the Southern Pacific Railway Stock Yards at Los Angeles, Cal.; the stock yards at Colton, Cal., and Bakersfield, Cal.; the Sapulpa stock yards of the St. Louis and San Francisco Railroad at Sapulpa, Ind. T., and at the stock yards of the Missouri, Kansas and Texas Railway at Muscogee, Ind. T., subject to the following restrictions, to wit:

The cattle shall be free from ticks (*Boophilus annulatus*) and shall not have been unloaded at any point in the modified quarantined area other than the authorized unload-

ing points named herein. The cattle shall be reloaded into the same cars from which unloaded or into other cleaned and disinfected cars and reshipped as uninfected cattle.

INTERPRETATION.

This Rule 1, Revision 2, shall be construed in connection with the regulations of the Secretary of Agriculture promulgated March 22, 1907, and effective on and after April 15, 1907, and is subject to amendment or revision on statutory notice.

Rule 1, Revision 1, dated January 25, 1906, effective February 1, 1906, and all amendments thereto, shall cease to be effective on and after April 15, 1907, on and after which date this Rule 1, Revision 2, which for purposes of identification is designated as B. A. I. Order No. 144, shall become and be effective until otherwise ordered.

Done at Washington this twenty-second day of March, 1907.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] JAMES WILSON, *Secretary of Agriculture.*

(B. A. I. ORDER NO. 145.)

Rule 2, Revision 1.—To Prevent the Spread of Scabies in Cattle (Effective on and after April 15, 1907).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The fact has been determined by the Secretary of Agriculture, and notice is hereby given, that a contagious communicable disease known as scabies exists among cattle in the following-named States and Territories, to wit:

MONTANA, NORTH DAKOTA, SOUTH DAKOTA, NEBRASKA, KANSAS, COLORADO, WYOMING, TEXAS, NEW MEXICO, and OKLAHOMA.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, under authority conferred by section 1 of the act of Congress approved March 3, 1905 (33 Stat., 864), do hereby quarantine the following territory, to wit:

The State of NEBRASKA; the counties of Teton, Chouteau, Valley, and Dawson, in the State of MONTANA; the counties of Williams, Ward, Billings, Stark, Mercer, Oliver, McLean, Morton, Burleigh, Wells, Eddy, Foster, Kidder, Stutsman, Emmons, Logan, and McIntosh, in the State of NORTH DAKOTA; that part of the State of SOUTH DAKOTA lying west of the Missouri River; that part of the State of KANSAS lying west of the western boundary lines of the counties of Barber, Pratt, Stafford, Barton, Russell, Osborne, and Smith; the counties of Sedgwick, Phillips, Logan, Weld, Morgan, Washington, Yuma, Boulder, Gilpin, Jefferson, Arapahoe, Douglas, Elbert, Lincoln, Kit Carson, Teller, El Paso, Cheyenne, Custer, Pueblo, Otero, Kiowa, Bent, Prowers, Huerfano, Las Animas, and Baca, that portion of Larimer County lying east of the Medicine Bow Range of mountains, and that portion of Fremont County lying east of the Ninth Guide Meridian West, in the State of COLORADO; the counties of Natrona, Converse, Carbon, Albany, and Laramie, in the State of WYOMING; that part of the State of TEXAS lying north and west of the southern boundary lines of the counties of Andrews, Martin, Howard, Mitchell, Nolan, and Taylor, and the 100th meridian of longitude west of Greenwich, and also the counties of Nueces, Cameron, and Hidalgo; the counties of Colfax, Mora, San Miguel, Union, Guadalupe, Quay, Chaves, Roosevelt, Eddy, that portion of Torrance County lying east and south of the El Paso and Rock Island Railway, that portion of Lincoln County lying east and south of the El Paso and Northeastern and the El Paso and Rock Island railways, and that portion of Otero County lying east of the El Paso and Northeastern Railway, in the Territory of NEW MEXICO; the counties of Woodward and Beaver, in the Territory of OKLAHOMA.

It is ordered by this Rule 2, Revision 1, under the authority and discretion conferred upon the Secretary of Agriculture by section 3 of the act of Congress approved March 3, 1905 (33 Stat., 864), that cattle shall be moved from the quarantined area of any State or Territory to any other State or Territory or District only in accordance with the regulations of the Secretary of Agriculture, designated as B. A. I. Order No. 143, promulgated March 22, 1907, and effective April 15, 1907.

This Rule 2, Revision 1, is subject to amendment or revision on statutory notice.

Rule 2, dated May 1, 1905, effective June 1, 1905, and Amendment No. 1 to Rule 2, dated August 30, 1905, and effective September 15, 1905, and Amendment No. 2 to Rule 2, dated August 30, 1906, and effective September 15, 1906, shall cease to be effective on and

after April 15, 1907, on and after which date this Rule 2, Revision 1, which for purposes of identification is designated as B. A. I. Order No. 145, shall become and be effective until otherwise ordered.

Done at Washington this twenty-second day of March, 1907.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] JAMES WILSON, *Secretary of Agriculture.*

(B. A. I. ORDER NO. 146.)

Rule 3, Revision 1.—To Prevent the Spread of Scabies in Sheep (Effective on and after April 15, 1907).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The fact has been determined by the Secretary of Agriculture, and notice is hereby given, that a contagious communicable disease known as scabies exists among sheep in the following-named States and Territories, to wit:

WASHINGTON, OREGON, MONTANA, NORTH DAKOTA, SOUTH DAKOTA, CALIFORNIA, NEVADA, IDAHO, UTAH, WYOMING, COLORADO, NEBRASKA, KANSAS, TEXAS, ARIZONA, and NEW MEXICO.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, under authority conferred by section 1 of the act of Congress approved March 3, 1905 (33 Stat., 864), do hereby quarantine the following area, to wit:

All territory situate within the boundaries of Washington, Oregon, Montana, North Dakota, South Dakota, California, Nevada, Idaho, Utah, Wyoming, Colorado, Nebraska, Kansas, Texas, Arizona, and New Mexico.

It is ordered by this Rule 3, Revision 1, under the authority and discretion conferred upon the Secretary of Agriculture by section 3 of the act of Congress approved March 3, 1905 (33 Stat., 864), that sheep shall be moved from the quarantined area of any State or Territory to any other State or Territory or District only in accordance with the regulations of the Secretary of Agriculture designated as B. A. I. Order No. 143, promulgated March 22, 1907, and effective April 15, 1907.

This Rule 3, Revision 1, is subject to amendment or revision on statutory notice.

Rule 3, dated May 1, 1905, and effective June 1, 1905, shall cease to be effective on and after April 15, 1907, on and after which date this Rule 3, Revision 1, which for purposes of identification is designated as B. A. I. Order No. 146, shall become and be effective until otherwise ordered.

Done at Washington this twenty-second day of March, 1907.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT NO. 10 TO B. A. I. ORDER NO. 137.)

Amendment to Regulations 50, 56, and 64, Governing, Respectively, the Interstate and Foreign Transportation of Meats and Meat Food Products Prepared Prior to October 1, 1906, and of Meats and Meat Food Products of Animals Slaughtered by a Farmer on the Farm, and the Interstate Transportation of Imported Meats and Meat Food Products.

U. S. DEPARTMENT OF AGRICUTURE, OFFICE OF THE SECRETARY,
Washington, D. C., April 5, 1907.

For the purpose of preventing the use in interstate or foreign commerce of meats and meat food products which are unsound, unhealthful, unwholesome, or otherwise unfit for human food, under authority conferred upon the Secretary of Agriculture by the provisions of the act of Congress approved June 30, 1906 (34 Stat., 674), the following modifications of Regulations 50, 56, and 64 are hereby prescribed for the transportation in interstate and foreign commerce of the carcasses, meats, and meat food products of cattle, sheep, swine, and goats.

This amendment, which for the purpose of identification is designated as Amendment No. 10 to B. A. I. Order No. 137, shall become and be effective on and after April 15, 1907.

JAMES WILSON, *Secretary of Agriculture.*

Paragraph (*j*) of Regulation 50, contained in Amendment No. 4 to B. A. I. Order No. 137, and amended by Amendments Nos. 7 and 8 to B. A. I. Order No. 137, is hereby revoked and superseded by the following:

"(*j*) Sweet pickled, dry salted, smoked, and other similar meats, lard, lard compounds, lard substitutes, butterine, and oleomargarin shall be inspected, and if found to be clean, healthful, wholesome, and free from any condition contrary to the regulations governing the meat inspection of the United States Department of Agriculture they shall be labeled or marked as provided in paragraph (*k*) of this regulation: *Provided,* That shippers who are in possession of sweet pickled, dry salted, smoked, or other similar meats, lard, lard compounds, lard substitutes, butterine, and oleomargarin which were on hand October 1, 1906, and who have an affidavit of the packer who prepared the meat or product that it was cured or prepared prior to October 1, and that no prohibited preservative has been applied thereto, except as allowed by Regulation 60, may, *on and after April 15, 1907, by obtaining the written permission of the Chief of the Bureau of Animal Industry, Department of Agriculture,* mark sweet, clean, sound, wholesome meat or meat food product with the words 'Inspected and Passed under Regulation 50—Provisional,' and such meat or product will then be admitted into interstate and foreign commerce. All persons who mark or ship meat or meat food product under this amendment shall immediately report to the Chief of the Bureau of Animal Industry at Washington a full description and the weight of the meat or product so marked and shipped. This amendment is issued because it is impossible, without seriously interfering with the commerce of the country, to examine each piece of meat in the United States. Attention is called, however, to the fact that it is a violation of law punishable by a fine of $10,000 and imprisonment for a term of two years for any person to forge, counterfeit, simulate, or use without authority any of the marks provided for by the Regulations of the Secretary of Agriculture. The movement of meat under the provisional marking provided for by this amendment will be closely watched, and any violation of the regulations will be prosecuted."

Regulation 56 and the certificate prescribed therein, as contained in Amendment No. 2 to B. A. I. Order No. 137, are hereby revoked and superseded by the following:

"*Regulation 56.*—When any cattle, sheep, swine, or goats have been slaughtered by any farmer on the farm, and the carcasses, parts of carcasses, or meat food products thereof are offered to any common carrier for transportation from one State or Territory or the District of Columbia to another State or Territory or the District of Columbia, the common carrier may so transport such carcasses, parts of carcasses, or meat food products as long as the same may be identified as of animals slaughtered by any farmer on the farm."

The common carriers shall require the following certificate in duplicate:

(Date)_____, 190

Name of railroad to which offered_____
Shipper _____
Consignee _____
Point of shipment_____
Point of destination_____

I hereby certify that the following-described uninspected meats or meat food products are from animals slaughtered by a farmer on the farm and are offered for transportation in interstate or foreign commerce, as exempted from inspection according to act of Congress of June 30, 1906; and that, at the time of this shipment, they are sound, healthful, wholesome, and fit for human food.

Description and weight of shipment.

_____
_____
_____

_____
(Signature of shipper.)

_____
(Business or occupation of shipper.)

_____
(Address of shipper.)

The duplicate certificate shall be forwarded immediately to the Chief of the Bureau of Animal Industry, Washington, D. C.

Regulation 64 and the certificate prescribed therein, as contained in Amendment No. 7 to B. A. I. Order No. 137, are hereby revoked and superseded by the following:

"*Regulation 64.*—Imported meats and meat food products, which have not been mixed or compounded with or added to domestic meats or meat food products, may be transported by any common carrier from one State or Territory or the District of Columbia into another State or Territory or the District of Columbia if the packages containing them shall be marked 'Inspected under the Food and Drugs Act of June 30, 1906,' and are so marked when received for transportation."

[B. A. I. ORDER NO. 142.]

Regulations for the Inspection and Quarantine of Horses, Cattle, Sheep, and Other Ruminants, and Swine Imported into the United States.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., April 4, 1907.

Under authority of sections 7, 8, and 10 of the act of Congress approved August 30, 1890, entitled "An act providing for the inspection of meats for exportation, and prohibiting the importation of adulterated articles of food or drink, and authorizing the President to make proclamation in certain cases, and for other purposes" (26 Stat., 414), and of the act of Congress approved February 2, 1903, entitled "An act to enable the Secretary of Agriculture to more effectually suppress and prevent the spread of contagious and infectious diseases of live stock, and for other purposes" (32 Stat., 791), the following regulations, which for the purpose of identification are designated as B. A. I. Order No. 142, are issued, superseding all previous regulations on the same subject, and shall become and be effective on and after April 15, 1907.

JAMES WILSON, *Secretary.*

GENERAL PROVISIONS.

PORTS OF IMPORT AND QUARANTINE AND INSPECTION STATIONS.

Regulation 1.—With the approval of the Secretary of the Treasury, the following-named ports, subports, and customs stations are hereby designated as quarantine stations, and all horses, cattle, sheep, and other ruminants, and swine imported into the United States and which are subject to both quarantine and inspection must be entered through said stations, viz: On the Atlantic seaboard: Boston, Mass.; New York, N. Y.; and Baltimore, Md. On the Pacific seaboard: San Francisco and San Diego, Cal., and Port Townsend, Wash. Along the boundary line between the United States and Mexico: Nogales, Ariz.; El Paso, Eagle Pass, Laredo, and Brownsville, Tex. Along the border or boundary line between the United States and Canada: Vanceboro, Houlton, Van Buren, and Fort Fairfield, Me.; Beecher Falls, Island Pond, Newport, Richford, and St. Albans, Vt.; Rouses Point, Hogansburg, Massena, Ogdensburg, Cape Vincent, Clayton, Charlotte, Niagara Falls, and Buffalo, N. Y.; Detroit, Port Huron, and Sault Ste. Marie, Mich.; and Pembina, N. Dak.

The following-named stations are designated for the entry of animals which are subject to inspection but not to quarantine, viz: Eastport and Calais, Me.; Derby Line, North Troy, Alburg, and Swanton, Vt.; Mooers Junction, Chateaugay, Fort Covington, Malone, Waddington, Morristown, Lisbon, and Alexandria Bay, N. Y.; Blaine, Sumas, and Seattle, Wash.

DEFINITION OF TERMS.

Regulation 2.—Whenever in these regulations the following words, names, or terms are used they shall be construed as follows:

Animals.—This word refers to and includes all or any of the following kinds: Horses, asses, mules, cattle, sheep, and other ruminants, and swine.

Horses.—This word refers to and includes horses, asses, and mules.

Ruminants.—This word refers to and includes all animals which chew the cud, or regurgitate a portion of their food for a second mastication before finally swallowing it, such as cattle, sheep, goats, deer, antelopes of all varieties, camels, dromedaries, alpacas, llamas, giraffes, and buffaloes of various kinds. The regulations applying to sheep will govern for all ruminants except cattle.

Cattle.—This word refers to the domestic animals of the bovine species, but shall include in addition the bisons and various kinds of buffaloes.

Other ruminants refers to all animals defined above under "Ruminants," except such as are embraced in the foregoing definition for "Cattle."

Swine.—The word swine refers to and includes the domestic hog, the wart hog, the water hog, and other varieties of wild hogs prized by owners of menageries and zoological collections.

Contagious diseases.—These words include and apply to all or any of the following diseases: Glanders and farcy, maladie du coït, distemper or strangles, epizootic, lymphangitis, anthrax, contagious pleuro-pneumonia, Texas or splenetic fever, tuberculosis, foot-and-mouth disease, rinderpest, surra, variola, foot rot, scabies, hog cholera, swine

plague, swine erysipelas, and other contagious or infectious diseases of cattle, sheep, or other ruminants, and swine.

Inspector.—The word inspector, unqualified, refers to the veterinary inspector of the Bureau of Animal Industry in charge of the quarantine station.

HORSES AND ACCOMPANYING FORAGE.

Regulation 3.—All horses imported into the United States from any part of the world except North America shall be required to pass a veterinary inspection at the port of entry by an inspector of the Bureau of Animal Industry. Such inspector shall not allow the landing of any hay, straw, or forage which accompanies shipments of horses from any country on the continent of Europe until it has been disinfected as the inspector may prescribe. In case the inspector finds horses affected with any contagious disease he shall isolate them and immediately report the fact to the Chief of the Bureau of Animal Industry, who may refuse to allow the landing of horses so diseased. When horses imported from the continent of Europe arrive in a healthy condition, and no diseased condition is discoverable, the hay, straw, and other forage from the continent of Europe may remain on board the steamer and be returned. This forage may be used without disinfection in the feeding of animals exported on the same ship, provided there are no indications that it is infected; but if the forage is found to be infected the fact must be reported to the Chief of the Bureau of Animal Industry, who will direct the disposition to be made thereof.

CERTIFICATE FOR RUMINANTS.

Regulation 4.—All ruminants imported into the United States from any part of the world except North America shall be accompanied by a certificate from the local authority of the district in which the said animals have been continuously located for six months next preceding the date of shipment, stating that no contagious pleuropneumonia, foot-and-mouth disease, anthrax, rinderpest, or any other disease contagious to cattle, except tuberculosis and actinomycosis, has existed in said district for one year preceding.

RUMINANTS AND SWINE FROM THE NETHERLANDS AND BELGIUM.

Regulation 5.—Ruminants and swine from the Netherlands and Belgium will not be eligible for entry into the United States if shipped through or landed at any port in continental Europe outside of the Netherlands and Belgium. They should be shipped direct to the United States, or may be transshipped at an English port.

CERTIFICATE FOR SWINE.

Regulation 6.—All swine imported into the United States from any part of the world except North America shall be accompanied by a certificate similar to the one required for cattle, sheep, and other ruminants, but relating to the existence of foot-and-mouth disease, hog cholera, swine plague, and erysipelas.

AFFIDAVIT FOR RUMINANTS AND SWINE.

Regulation 7.—All ruminants and swine imported into the United States from any part of the world except North America shall also be accompanied by an affidavit by the owner stating that said animals have been continuously located in the district whence shipped for six months next preceding the date of shipment, that no contagious disease affecting the species of animals imported has existed among them nor among any animals of the kind with which they have come in contact for six months last past, and that no inoculation has been practiced among said animals during the preceding year; also by an affidavit from the importer or his agent supervising the shipment, stating that they have not passed through any district infected with contagious diseases affecting said kind of animals, that they have not been exposed in any possible manner to the contagion of any of said contagious diseases, and that the animals, when not driven, have been shipped in clean and disinfected cars and vessels direct from the farm where purchased.

PRESENTATION OF PAPERS TO COLLECTOR OF CUSTOMS.

Regulation 8.—The certificates and affidavits hereinabove required must accompany said animals and be presented to the collector of customs at the port of entry and be by him delivered to the inspector of the Bureau of Animal Industry stationed at said port, to allow the animals to be imported into the United States.

PERIOD OF QUARANTINE.

Regulation 9.—All cattle imported into the United States from any part of the world except North America, Great Britain, Ireland, and the Channel Islands shall be subject to a quarantine of ninety days, counting from the date of shipment, this date of shipment to be the date of clearance of the vessel bringing the animals to the United States. Sheep and other ruminants and swine from any part of the world except North America shall be subject to a quarantine of fifteen days, counting from the date of arrival at the quarantine station: *Provided,* That cattle and sheep imported for immediate slaughter at the port of landing may be imported without quarantine, but shall be subject to such restrictions as the Chief of the Bureau of Animal Industry, after causing an inspection to be made, may consider necessary in each case for guarding the domestic animals of the United States from contagion: *Provided further,* That the period of quarantine for cattle imported from Great Britain, Ireland, and the Channel Islands shall be sixty days, counting from the date of shipment.

TUBERCULIN TEST FOR CATTLE.

Regulation 10.—All cattle 6 months old or over imported from Great Britain, Ireland, the Channel Islands, the Netherlands (Holland), and Belgium directly into the United States, and which are subject to quarantine, shall be tested with tuberculin by an inspector of the Bureau of Animal Industry before being exported or after arrival at the animal quarantine station at the port of entry; and, when considered necessary, a subsequent tuberculin test of imported cattle shall be made during the last two weeks of their quarantine period. Cattle from countries not otherwise provided for shall be tested in the said quarantine station. All cattle so tested which show a reaction shall be prohibited from entry into the United States or be disposed of as provided in Regulation 15 of these regulations. Persons desiring animals tested abroad should address the inspector of the United States Bureau of Animal Industry, care of United States consul's office, Liverpool, England.

PERMITS FOR IMPORT ANIMALS.

Regulation 11.—Any person contemplating the importation of cattle, sheep, and other ruminants, and swine from any part of the world except North America must first obtain from the Secretary of Agriculture two permits, one stating the number and kind of animals to be imported, the port, and the probable date of shipment, which will on presentation to the American consul at the said port of shipment entitle them to clearance; the other stating the port at which said animals are to be landed and quarantined and the approximate date of their arrival, and this will assure the reception of the number and kind of animals specified therein at the port and quarantine station on the date prescribed for their arrival or at any time during three weeks immediately following, after which the permit will be void. These permits shall in no case be available at any port other than the one mentioned therein. Permits must be in the name of the owner of or agent for any one lot of animals. Permits will be issued to quarantine at such port as the importer may elect, so far as facilities exist at such port, but in no case will permits for importation at any port be granted in excess of the accommodations of the Government quarantine station at such port.

PAPERS BY UNITED STATES CONSULS.

Regulation 12.—United States consuls should give clearance papers or certificates for animals from their districts intended for exportation to the United States only upon presentation of permits as above provided, with dates of probable arrival and destination corresponding with said permits, and in no case for a number in excess of that mentioned therein. When such shipments originate in the interior of a foreign country these permits should be submitted to the consul of that district and through the forwarding agent to the consul at the port of embarkation.

INSPECTION.

Regulation 13.—All animals imported into the United States and which are subject to inspection shall be carefully inspected by an inspector of the Bureau of Animal Industry, and all animals found to be free from disease and not to have been exposed to any contagious disease shall be admitted into the United States, subject to the provisions for quarantine as required by Regulation 9, except as otherwise provided.

QUARANTINE RELEASE.

Regulation 14.—A release from quarantine will be given to each owner for the number and kind of animals belonging to him which are discharged from quarantine, and this release will be a certificate of fulfillment of quarantine regulations. In case an importation of animals is owned by more than one person a release will be issued to each owner or agent covering the animals which belong to him.

DISPOSAL OF DISEASED ANIMALS.

Regulation 15.—Whenever any animal on arrival at the port of entry or in the quarantine station is found to be affected with a contagious disease or to have been exposed to such disease, said animal and all animals that have been in contact with or exposed to said animal shall be placed in special quarantine. All animals so quarantined either on arrival at port of entry or after reaching the quarantine station shall be at once reported by the inspector to the Chief of the Bureau of Animal Industry, who will direct whether or not said animals quarantined shall be appraised and slaughtered as provided by section 8 of the act approved August 30, 1890.

DISINFECTION OF VESSELS.

Regulation 16.—If a shipment of imported animals shall prove to be infected with or to have been exposed to infection, such portions of the cargo or the vessel on which they arrived as have been exposed to these animals or their emanations shall be subjected, under the direction of the inspector of the Bureau of Animal Industry, to disinfection in such manner as may be considered necessary by said inspector before the shipment can be landed. In all cases the parts of the vessel that have been occupied by imported animals shall be cleaned and disinfected with limewash, under the supervision of the inspector of the port.

ARTICLES ACCOMPANYING ANIMALS.

Regulation 17.—No litter, fodder, or other aliment, nor any ropes, straps, chains, girths, blankets, poles, buckets, or other things used for or about the animals, and no manure shall be landed from any vessel excepting under such regulations as the inspector shall prescribe.

MOVEMENT FROM VESSELS TO QUARANTINE STATIONS.

Regulation 18.—On moving animals from the ocean steamer to the quarantine grounds they shall not be unnecessarily passed over any highways, but shall be placed on cars at the wharves or removed to the cars on a boat which is not used for conveying other animals. If such boat has carried animals within three months it must be first cleaned and then disinfected under the supervision of the inspector, and after the conveyance of the imported animals the boat shall be disinfected in the same manner before it may be again used for the conveyance of animals. When passage upon or across the public highway is unavoidable in the transportation of animals from the place of landing to the quarantine grounds it shall be under such careful supervision and restrictions as the inspector and the local authorities may in special cases direct.

SPECIAL PLATFORMS AND CHUTES.

Regulation 19.—Platforms and chutes used for loading and unloading imported animals shall be reserved for such animals, or shall be cleaned and disinfected as above before being used for such imported animals.

SPECIAL CARS.

Regulation 20.—The railway cars used in the transportation of animals to the quarantine grounds shall be either cars reserved for their exclusive use or box cars not otherwise employed in the transportation of animals or their fresh products, and after each journey with animals to the quarantine grounds they shall be disinfected by thorough cleansing and disinfection under the direction of the inspector.

REQUIREMENTS AT QUARANTINE STATIONS.

ARRIVAL OF ANIMALS.

Regulation 21.—While animals are arriving at the quarantine stations or leaving them, all quarantined stock in the yards adjoining the alleyways through which they must pass

shall be rigidly confined to their stables. Animals arriving by the same ship may be quarantined together in one yard and stable, but those coming on different ships shall in all cases be placed in separate yards.

GATES AT STATION.

Regulation 22.—The gates of the quarantine stations and of all yards of said stations shall be kept locked except when animals are entering or leaving quarantine.

ANIMAL ATTENDANTS.

Regulation 23.—The attendants on animals in particular yards are forbidden to enter other yards and buildings unless such are occupied by stock of the same shipment with those under their special care.

DOGS, CATS, ETC., PROHIBITED.

Regulation 24.—No dogs, cats, or other animals, except those necessarily present, shall be allowed in the quarantine grounds.

RECORD KEPT BY INSPECTOR.

Regulation 25.—The allotment of yards shall be under the direction of the inspector, who shall keep a register of animals entered, with description, name of owner, name of vessel in which imported, date of arrival and release, and other important particulars

WATER; MANURE.

Regulation 26.—The inspector shall see that water is regularly furnished to the stock. Special places for depositing manure from yards and stables shall be provided, and no manure shall be removed from the quarantine station until the release of the animals producing the same.

DISPOSAL OF MILK.

Regulation 27.—Milk from quarantined animals shall not be used by any persons other than those in charge of such animals, nor fed to any other animals than those within the same lot, until the animals have been in quarantine ten days.

FEED AND ATTENDANTS TO BE PROVIDED BY OWNER.

Regulation 28.—Feed and attendants shall be provided by the owners of stock quarantined, and said owner or his agent shall give satisfactory assurance to the inspector at the time of admission to quarantine that such provision will be made. The employees of such owners shall keep the sheds and yards clean to the satisfaction of the inspector and be subject to the rules at the station. If for any cause the owners of the quarantined stock refuse or neglect to supply feed and attendants, the inspector will furnish the same. The feed and care so furnished shall be at the expense of the owner of the stock and the charges therefor will be a lien on the animals. After the expiration of one-third of the quarantine period, if payment has not been made, the owners of the animals will be notified by the inspector that if said charges be not immediately paid, or satisfactory arrangements made for the payment, the inspector will sell the stock at public auction at the expiration of the period of quarantine to pay the expense of feed and care during that period. Notice of the sale will be published once a week for two weeks in a newspaper published in the county where the station is located. The day of sale will be at the expiration of the quarantine period, and the sale will be made at such place as may be designated by the inspector. From the proceeds of the sale an amount equal to the charges for feed and care of the animals and the expense of the sale will be covered into the United States Treasury, and the remainder, if any, will be held for the owners, but if not called for at the end of six months from the date of sale this balance will be deposited in the United States Treasury.

SMOKING, VISITORS, AND PUBLIC SALES.

Regulation 29.—Smoking is strictly forbidden within any quarantine inclosure. No visitors shall be admitted to the quarantine station without special written permission from the inspector. Butchers, cattle dealers, and their employees are especially excluded. No public sale shall be allowed within quarantine grounds.

RECORD OF TEMPERATURES.

Regulation 30.—The inspector shall, in his daily rounds, so far as possible, take the temperature of each animal, beginning with the herds that have been longest in quarantine and ending with the most recent arrivals, and shall record such temperatures on lists kept for that purpose. In passing from one herd to another he shall invariably wash his thermometer and hands in a weak solution (1 to 40) of carbolic acid.

APPEARANCE OF DISEASE IN QUARANTINE.

Regulation 31.—If any disease diagnosed to be of a contagious nature shall appear the inspector shall notify the Chief of the Bureau of Animal Industry, who shall visit the station personally or send a veterinary inspector, and on the confirmation of the diagnosis the herd shall be disposed of according to the gravity of the affection. The yard and shed in which such disease shall have appeared shall be subjected to a thorough disinfection. Litter and fodder shall be burned. Yards, fences, sheds, utensils, and other appliances shall be disinfected as the Chief of the Bureau of Animal Industry may direct. In case of the appearance of any contagious disease the infected herd shall be rigidly confined to its stable or stables, where disinfectants shall be freely used, and the attendants shall be forbidden all intercourse with the attendants in other yards and with persons outside the quarantine grounds.

IMPORTATION OF PUREBRED ANIMALS FOR BREEDING PURPOSES.

Regulation 32.—Importers of animals which are subject to both inspection and quarantine, imported for breeding purposes and intended to be entered free of duty under the provisions of paragraph 473 of the tariff act of July 24, 1897, will not be required to give the bond or stipulation for the production of registry certificates, provided for by the customs regulations, until the end of the quarantine period, in order that they may avail themselves of such period to transfer the registration of imported animals from the foreign to the affiliated American books of registry. Such animals will not, however, be released from quarantine except upon notice from the collector of customs that all requirements of the customs regulations relative to their entry have been complied with by the importer.

IMPORTATIONS FROM NORTH AMERICAN COUNTRIES.

CONSIGNMENTS FOR SLAUGHTER.

Regulation 33.—Animals admitted from North American countries for immediate slaughter shall be consigned to some recognized slaughtering center, and shall be slaughtered within two weeks from the date of entry. All animals admitted for export shall be subject to inspection at the port of entry.

CANADA.

AFFIDAVIT TO ACCOMPANY ANIMALS.

Regulation 34.—All animals imported into the United States from the Dominion of Canada shall be accompanied by an affidavit made by the owner or importer, declaring clearly the purpose for which said animals are imported, viz, whether for breeding purposes, for milk production, for work, for grazing, feeding, or slaughter, or whether they form part of settlers' effects, or whether they are horses entered for temporary stay, as provided by Regulation 35. Said affidavit shall be presented to the collector of customs at the port of entry, who will decide whether the animals are entitled to entry under these regulations, and who will notify the inspector of the Bureau of Animal Industry in all cases where the regulations require an inspection to be made.

HORSES.

Regulation 35.—Horses for breeding, racing, show, and sale purposes, for grazing or for work, shall be inspected at the port of entry. Those belonging to Indian tribes and settlers and those used in connection with stock raising (cow ponies) or mining, and those for temporary stay at points along the frontier not exceeding two weeks, whether for pleasure, driving, or teaming, may be admitted without inspection, upon written permission from the Secretary of Agriculture first had and obtained. Horses may be admitted in bond at any port of the United States, without inspection, for export from any port of the United States; they shall, however, be subject to inspection when exported from ports at which this Department has inspectors stationed.

CATTLE.

Regulation 36.—Cattle for breeding purposes, milk production, grazing, or feeding must be inspected and must be accompanied by a certificate signed by a Canadian official veterinarian, stating that no contagious disease affecting cattle, except tuberculosis and actinomycosis, has existed in the district in which the animals have been kept for six months preceding the date of importation. The owner must present an affidavit that said certificate refers to the cattle in question.

TUBERCULIN TEST FOR CATTLE.

Regulation 37.—Cattle over 6 months old for breeding purposes and milch cows shall also be accompanied by a satisfactory certificate of tuberculin test (which test shall have been made within thirty days of the date of importation by a Canadian official veterinarian or an inspector of the Bureau of Animal Industry), giving the date and place of testing and a description of the cattle, with age and markings.

CATTLE FOR EXHIBITION PURPOSES.

Regulation 38.—The Chief of the Bureau of Animal Industry may, however, by written order, waive the foregoing tuberculin test requirement for cattle to be imported temporarily for exhibition purposes, provided such cattle are accompanied by a satisfactory certificate of tuberculin test made not more than six months previously and an affidavit by the owner or importer stating that the said certificate of tuberculin test refers to the cattle in question. Any such cattle which are not sold to remain in the United States shall be returned immediately to Canada at the close of the exhibition. The Department must be notified of any Canadian cattle which will remain in the United States, not tested as required by Regulation 37, and the tuberculin test will be applied to them by an inspector of this Department before shipment to destination. All cattle, sheep, and swine intended for exhibition purposes must be shipped directly to the exhibition grounds and must not be unloaded in any public stock yards.

CATTLE QUARANTINED.

Regulation 39.—All cattle imported for breeding, milk production, grazing, or feeding, when not accompanied by the required affidavits and certificates, must be detained in quarantine for one week at the expense of the owner or importer, under the supervision of the inspector. During this detention a rigid inspection will be made and cattle for breeding or milk production which are over 6 months old will be tested with tuberculin. Animals found free from disease at the end of that period will be released.

INSPECTION OF CATTLE.

Regulation 40.—Cattle for slaughter shall be inspected. Those forming part of settlers' effects or belonging to Indian tribes may be admitted through any port without inspection or certification upon written permission of the Secretary of Agriculture first had and obtained. Cattle in bond for export may be admitted without inspection at any of the ports named in Regulation 1 in transit to and for export from Portland, Me., Boston, Mass., New York, N. Y., Philadelphia, Pa., Baltimore, Md., and Newport News and Norfolk, Va., subject to inspection at the port of export: *Provided,* That inspection may be required by the Secretary of Agriculture whenever in his opinion such inspection is necessary.

SHEEP.

Regulation 41.—All sheep imported into the United States for breeding, grazing, or feeding must be inspected and must be accompanied by a certificate signed by a Canadian official veterinarian, stating that no contagious diseases affecting sheep has existed in the district in which the animals have been kept for six months preceding the date of importation. The owner or importer shall present an affidavit that said certificate refers to the sheep in question: *Provided, however,* That the importation of sheep not showing signs of scabies or other disease may be permitted from a district infected with scab, if such sheep are accompanied by a certificate signed by a Canadian official veterinarian, stating that they have been twice carefully dipped under his personal supervision, or under the personal supervision of a Canadian official veterinarian, in a lime-and-sulphur dip or a tobacco-and-sulphur dip, prepared as follows, or in any other dip which may be approved by the Secretary of Agriculture: The lime-and-sulphur dip made with 8 pounds of unslaked lime and 24 pounds of flowers of sulphur to 100 gallons of water. The lime and the sulphur should be boiled together for not less than two hours, and all sediment allowed to subside before the liquid is placed in the dipping vat. The tobacco-and-sulphur dip made with sufficient extract of tobacco or nicotine solution

to give a mixture containing not less than five one-hundredths of 1 per cent of nicotine and 2 per cent flowers of sulphur.

SHEEP FOR SLAUGHTER, EXPORT, ETC.

Regulation 42.—Sheep for immediate slaughter and those belonging to Indian tribes or forming parts of settlers' effects will be admitted at any port without inspection when accompanied by a certificate of an official veterinarian showing freedom from disease. Sheep in bond for export will be admitted without inspection when accompanied by such certificate at any of the ports mentioned in Regulation 1 in transit to and for export from Portland, Me., Boston, Mass., New York, N. Y., Philadelphia, Pa., Baltimore, Md., and Newport News and Norfolk, Va., subject to inspection at the port of export.

SWINE.

Regulation 43.—All swine shall be subjected to inspection and shall be accompanied by a certificate signed by a Canadian official veterinarian stating that no swine plague nor hog cholera has existed within a radius of 5 miles of the premises in which they have been kept for a period of six months immediately preceding the date of shipment. The owner or importer must present an affidavit that the said certificate refers to the swine in question. Swine not accompanied by affidavit and certificate will be subject to a quarantine of two weeks at the expense of the owner or importer, under the supervision of the inspector.

CARS TO BE CLEANED AND DISINFECTED.

Regulation 44.—The railroad cars used in the transportation of animals specified by these regulations must be thoroughly cleaned and disinfected before such animals are placed therein. All litter from previous shipments must be removed and the car whitewashed with lime and carbolic acid—1 pound of crystallized carbolic acid to 5 gallons of limewash. Unless this regulation is complied with, Canadian animals will not be allowed entry into the United States, and animals from the United States will not be admitted into Canada. The shipper should see that the cars are properly cleaned and disinfected before animals are loaded.

MEXICO.

HORSES.

Regulation 45.—Horses for breeding, racing, show, and sale purposes, for grazing or for work, shall be inspected at the port of entry. Those belonging to Indian tribes and settlers and those used in connection with stock raising (cow ponies) or mining, and those for temporary stay at points along the frontier not exceeding two weeks, whether for pleasure, driving, or teaming, are not required to be inspected. Horses will be admitted in bond at any port of the United States upon inspection, for export from any port of the United States. They shall, however, be subjected to inspection when exported from ports at which this Department has inspectors stationed.

CATTLE.

Regulation 46.—Cattle imported into the United States from Mexico are subject to inspection. Cattle for breeding purposes, milk production, grazing, or feeding shall be accompanied by an affidavit made by the owner stating that said cattle have been in the district from which shipped for six months next preceding the date of importation, and that no contagious disease affecting cattle has existed among them or among any animals of the kind with which they have come in contact for six months last past; also by an affidavit made by the importer or his agent supervising the shipment, stating that they have not passed through any district infected with contagious diseases affecting cattle, that they have not been exposed in any possible manner to the contagion of any contagious disease, and that the animals, when not driven, have been shipped in cleaned and disinfected cars and vessels direct from the farm or ranch where purchased.

CATTLE QUARANTINED.

Regulation 47.—Cattle imported for breeding purposes, milk production, grazing, or feeding, when not accompanied by the required affidavits, shall be detained in quarantine for one week at the expense of the owner or importer, under the supervision of the inspector. During this detention a rigid inspection shall be made.

CATTLE FOR SLAUGHTER.

Regulation 48.—Cattle for immediate slaughter may be admitted when by inspection they are found free from disease. When so entered, cattle shall be subject to the rule and the regulations pertaining to the transportation of cattle from the district infected with Texas or splenetic fever.

SHEEP.

Regulation 49.—Sheep for breeding purposes, grazing, or feeding will be admitted if found upon inspection by an inspector of the United States Bureau of Animal Industry to be free from scabies or other contagious diseases and are accompanied by an affidavit made by the owner stating that they have been in the district from which shipped for six months next preceding the date of importation and that no contagious disease affecting sheep has existed among them nor among other animals of the kind with which they have come in contact for six months last past; also by an affidavit made by the importer or his agent supervising the shipment, stating that they have not passed through any district infected with contagious diseases affecting sheep, and that they have not been exposed in any possible manner to the contagion of any contagious disease, and that the animals, if not driven, have been shipped in cleaned and disinfected cars and vessels direct from the farm or ranch where purchased. But such sheep shall nevertheless be dipped at the expense of the owner or importer, as prescribed by the rule and regulations of the Secretary of Agriculture, before being permitted to proceed to their destination in the United States or to mingle with other sheep.

SHEEP QUARANTINED.

Regulation 50.—Sheep for breeding purposes, grazing, or feeding, not accompanied by the required affidavits, must be detained in quarantine for one week, or as long as may be required, at the expense of the owner or importer, under the supervision of the inspector, and twice dipped in a dip provided for in the foregoing regulations.

SHEEP FOR SLAUGHTER.

Regulation 51.—Sheep for immediate slaughter will be admitted subject to inspection by an inspector of the Bureau of Animal Industry. If scab or any other contagious disease affecting sheep is found to exist among them, they shall not be admitted.

SWINE.

Regulation 52.—All swine shall be accompanied by affidavits similar to those required for cattle and sheep relating to the existence of contagious disease affecting swine, and when not accompanied by said affidavits, shall be detained in quarantine for one week, as provided for cattle and sheep.

ANIMALS IN BOND.

Regulation 53.—Animals in bond to Canada entering and passing through United States territory will be subject to inspection at the port of entry, or at any point en route by an inspector of the Bureau of Animal Industry, and if found diseased or to have been exposed to the contagion of disease, shall be dealt with as the Secretary of Agriculture may direct, depending upon the nature of the disease, as provided by these regulations for the particular kind of animal or animals so affected or exposed.

(AMENDMENT NO. 1 TO B. A. I. ORDER NO. 144.)

Amendment No. 1 to Rule 1, Revision 2.—To Prevent the Spread of Splenetic Fever in Cattle (Effective from May 15 to 25, 1907).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

Exceptions 4 and 10 of Rule 1, Revision 2, are hereby modified as follows:

The time in the proviso, in each said exception, allowing the movement of dipped cattle into certain counties, parts of counties, nations, and registration districts, is hereby extended from May 15, 1907, to May 25, 1907.

Done at Washington this thirteenth day of May, 1907.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT NO. 2 TO B. A. I. ORDER NO. 144.)

Amendment No. 2 to Rule 1, Revision 2.—To Prevent the Spread of Splenetic Fever in Cattle (Effective on and after August 1, 1907).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The fact has been determined by the Secretary of Agriculture and notice is hereby given that the infectious disease known as splenetic, southern, or Texas fever is not now known to exist, or exists to a slight extent only, among cattle in certain portions of the State of California quarantined by Rule 1, Revision 2, dated March 22, 1907, and effective April 15, 1907.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, under authority of law, do hereby amend Rule 1, Revision 2, to prevent the spread of splenetic fever in cattle. This amendment, which will be effective on and after August 1, 1907, is designated as amendment No. 2 to B. A. I. Order No. 144 and is as follows, to wit:

First.—That part of Exception 1 which describes the quarantine line through the State of California is amended to read as follows:

"CALIFORNIA.

"Beginning on the Pacific coast where the northern boundary of San Luis Obispo County connects with the Pacific Ocean; thence easterly along the northern boundary of San Luis Obispo County to the northwestern corner of Kern County; thence southeasterly, easterly, and northerly following the western, southern, and eastern boundaries of Kern County to the northeast corner of said county; thence easterly along the northern boundary of San Bernardino County to the one hundred and sixteenth meridian west longitude; thence south following the one hundred and sixteenth meridian west longitude to the southern boundary of San Bernardino County; thence easterly along the southern boundary of San Bernardino County to the eastern boundary of the State of California; thence southerly along the eastern boundary of the State of California to the international boundary."

Second.—Exception 2 is amended to read as follows:

"*Exception 2—California.*—The island of Santa Rosa, a part of Santa Barbara County, on account of being free from Texas fever infection and being separated from the mainland, is not to be regarded as a part of the modified quarantined area. During the continuance of the quarantine as herein established and modified no cattle of the modified quarantined area of any State or Territory other than California shall be moved or allowed to move into the counties of Santa Barbara, San Luis Obispo, Los Angeles, and that portion of San Bernardino County west of the one hundred and sixteenth meridian west longitude.

"No cattle of the counties of Santa Barbara (except the island of Santa Rosa), San Luis Obispo, Los Angeles, that portion of San Bernardino County west of the one hundred and sixteenth meridian west longitude, and those portions of Madera and Fresno counties located west of the right of way of the main line of the Southern Pacific Company shall be moved or allowed to move, except as provided for immediate slaughter, to any point in the United States, not in the State of California, which is located outside of the modified quarantined area, until the said cattle shall have been inspected and found free of infection and a written permit for the shipment issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped."

Done at Washington this twenty-ninth day of June, 1907.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] JAMES WILSON, *Secretary of Agriculture.*

(B. A. I. ORDER NO. 147.)

Regulations Prescribed in Regard to Renovated Butter in Accordance with the Act of Congress Approved May 9, 1902.

WASHINGTON, D. C., *July 11, 1907.*

The following regulations in regard to renovated butter are issued jointly by the Secretary of the Treasury and the Secretary of Agriculture. These regulations become effective August 15, 1907, and on and after that date will supersede all previous regulations on the subject of renovated butter.

GEO. B. CORTELYOU,
Secretary of the Treasury.
W. M. HAYS,
Acting Secretary of Agriculture.

Regulation 1.—The act of May 9, 1902, gives to the manufacturer of renovated or process butter the option to call the product "renovated butter" or to call it "process butter."

For the sake of brevity the words "renovated butter" are used in these regulations as synonymous with the words "process butter." Therefore, any marking or branding with the words "renovated butter," required by these regulations, will be satisfied if the words "process butter" be used in lieu of the words "renovated butter."

Regulation 2.—The following explanation of the definition of renovated butter, as it occurs in the law, is adopted for guidance in connection with these regulations:

(*a*) This grade or kind of butter may be made from one or more lots or parcels of butter, which has been or have been "subjected to any process by which it is melted, clarified, or refined, and made to resemble genuine butter, always excepting 'adulterated butter,' as defined by this act." It may or may not have common salt and harmless artificial coloring added.

(*b*) The law defines three processes of refining butter, which, if used, make the resultant article adulterated butter, in contradistinction to renovated butter, as follows:

First, if in any way any acid, alkali, chemical, or *any substance whatever* is introduced or used for the purpose or with the effect of *deodorizing* or removing therefrom *rancidity;* second, if there is mixed any substance foreign to butter with intent or effect of cheapening in cost the product; and, third, if in any way the product is made to contain abnormal quantities of water, milk, or cream.

Butter which has been renovated and has 16 per cent or more of moisture will be held to contain abnormal quantities of water, milk, or cream, and will therefore be classed as adulterated butter.

Regulation 3.—Section 4 of the act of May 9, 1902, provides:

Manufacturers of process or renovated butter shall pay fifty dollars per year. * * * Every person who engages in the production of process or renovated butter * * * as a business shall be considered to be a manufacturer thereof.

The special-tax year begins July 1. The special tax of manufacturers who commence business in the month of July will be reckoned for one year, and the tax of manufacturers who commence business after the month of July will be reckoned proportionately from the first day of the month from which the liability to special tax commenced to the first day of July following.

Regulation 4.—Every manufacturer of renovated butter, before commencing business (or at least within the month in which liability to special tax commenced), must register with the collector of the district in which the business is to be carried on his name, or firm or corporate name, place of residence, nature of business, and the place where such business is to be carried on, and procure a special-tax stamp at the rate of $50 per annum, which stamp he shall place and keep conspicuously posted in his establishment or place of business; and on the first day of July in each year he must again so register and procure a new special-tax stamp and post it as above stated.

Regulation 5.—Every manufacturer of renovated butter will be required to file with the collector a notice on Form 507 together with an inventory, Form 509, when making application for special-tax stamp as manufacturer. At the same time he will file a bond, Form 508, in a penal sum to be fixed by the collector of internal revenue for his district, but in no case less than $500.

Collectors of internal revenue will decline to approve the bond of a manufacturer of renovated butter until they are satisfied that the premises to be used for the manufacture of that article are entirely separate from those used for the manufacture of adulterated

butter or oleomargarin, or for the handling or manipulation of butter not taxable under the act of May 9, 1902. (See Treas. Dec. No. 588, Oct. 6, 1902.)

Regulation 6.—Collectors will give to each manufacturer of renovated butter in their respective districts a factory number, the numbers to be consecutive and not thereafter changed. A new number should be given to a new factory. The change in ownership of a factory does not necessitate a change in the factory number.

Regulation 7.—Every manufacturer of renovated butter shall place and keep over the principal entrance of the factory wherein his business is carried on, so that it can be distinctly seen, a sign, with letters thereon not less than 3 inches in height, printed in oil colors or gilded, giving his full name and business and the number of his factory, as follows:

A ——— B ———

MANUFACTURER OF RENOVATED BUTTER.

Factory No. ———

Regulation 8.—Under the provisions of section 4 of the act of May 9, 1902, the tax of one-fourth of 1 cent per pound imposed thereby on renovated butter is to be represented by coupon stamps, to be provided by the Commissioner of Internal Revenue as authorized by existing laws. A fractional part of a pound shall be taxed as a pound.

Regulation 9.—For this purpose tax-paid stamps will be furnished in denominations of 10, 20, 30, 40, 50, 60, and 100 pounds, each stamp bearing nine coupons. Such stamps must contain the name of the collector, his district and State, and show thereon the date of payment of the tax, the number of pounds, and the number of the factory.

Regulation 10.—On the withdrawal of a package of renovated butter the proper tax-paid stamp must be affixed thereto by the manufacturer, by the use of adhesive material, and if the package be of wood not less than five tacks must be driven through each stamp, one in each corner and one in the middle of the stamp. The stamp when so affixed must be immediately canceled. The blank spaces reserved for the manufacturer must be properly filled up by him in accordance with the plain requirements of the form of the stamp. This is not optional with the manufacturer, but a requirement. In the blank space in the lower left-hand corner of the stamp must be inserted the date when the stamp was affixed and canceled. This is required to be done before the renovated butter is removed from the factory. The date of issue must be entered on the stamp by the collector at the time the same is issued.

For the purpose of cancellation the manufacturer will use a stencil plate or rubber stamp by which there shall be printed five parallel waved lines long enough to extend beyond each side of the stamp onto the package. The printing on the stamp must be plain and distinct, and the waved lines must be fine enough to avoid obliterating the reading matter and figures contained in the tax-paid stamp. The canceling must be with blacking or other durable coloring material, over and across the stamp, and in such manner as not to daub and make it illegible.

Regulation 11.—The stamp must be affixed to the side of the package, to a smooth surface, in such a manner as to be readily canceled in the manner above described. When a package contains a number of pounds between 10 and 20, a 10-pound stamp with the necessary number of coupons attached will be issued to cover the net weight. Packages containing more than 20 pounds and less than 30 pounds will have attached a 20-pound stamp with a suitable number of coupons to represent the contents. Larger sized packages will be similarly stamped.

Regulation 12.—Every manufacturer's package of renovated butter shall have affixed thereto a label on which shall be printed the number of the factory and the revenue district and State in which it is located, together with the following notice:

FORM FOR RENOVATED BUTTER.

Factory No. ———, ——— *district, State of* ———

NOTICE.—The manufacturer of the RENOVATED BUTTER herein contained has complied with all the requirements of the law and the regulations authorized thereby. Every person is cautioned not to use again either this package for renovated butter or tax stamp thereon, or to remove the contents of this package without destroying said stamp, under penalty provided by law in such cases.

This label or notice shall be printed in black, upon white paper, and shall be not less than 5 nor more than 7 inches long, and not less than 3 inches in width. The label must be securely affixed by paste to the side of the package and opposite or on a different side (not the top or bottom) from that to which the tax stamp is attached, and in such a way as to be exposed to view and easily read. The words "Renovated Butter" in

this notice must be printed in one or two lines and in plain gothic letters at least three-eighths of an inch square. There must also be plainly marked or stenciled on the outside of every package the gross, tare, and net weight in pounds.

Regulation 13.—Each manufacturer of renovated butter is required to keep books and make returns showing the quantity of materials received on the factory premises and the quantity of finished product removed therefrom. Sample pages of book (Form No. 511) to be kept by manufacturers will be furnished to collectors, but the book must be provided by the manufacturer, as the same is not supplied by the Government.

Regulation 14.—Form No. 499 has been prescribed for monthly returns of manufacturers of renovated butter, and such forms will be furnished through the collectors of internal revenue.

In preparing Form 499 manufacturers should note on pages 1 and 2 the quantities of materials used in producing renovated butter each day of the month and the quantity produced. On page 2 is a space provided for a special account of tax-paid renovated butter returned to the factory. On inside pages of Form 499 should be noted the date when renovated butter is sold, removed, or destroyed, together with the amount by packages and pounds; also to whom sold or consigned, giving the name, place of business, residence, county, and State.

The last page of this form contains a recapitulation of the quantity of renovated butter produced and disposed of during the month and the quantity on hand at the beginning and at the end of each month. This should be prepared with great care. The certificate in this form must be executed by the manufacturer, or his duly authorized representative, and be sworn to before a deputy collector or an officer authorized to administer oaths generally.

Regulation 15.—Whenever any manufacturer's package of renovated butter is empty it shall be the duty of the person who removes the contents thereof to destroy utterly the tax-paid stamp on such empty package. Any person having in his possession empty renovated butter packages the tax-paid stamps on which have not been destroyed will be liable to a heavy penalty.

The ruling by the Commissioner of Internal Revenue, under date of October 6, 1902, permitting the shipment of original packages of renovated butter covered with jute, burlap, or heavy paper from the place of manufacture or place of business of the wholesale dealer is hereby revoked, and all packages of renovated butter so covered or wrapped which may be found on the market on and after the date that these regulations become effective will not be deemed in compliance with the law.

Regulation 16.—Attention is called to the fact that the act named makes no provision for the exportation free of tax of renovated butter, nor for any drawback on such articles when exported. Consequently all renovated butter for export must be stamped the same as for domestic market.

The act of May 9, 1902, neither defines nor imposes special taxes upon wholesale or retail dealers in renovated butter. Renovated butter must always bear or be accompanied by the evidence that the manufacturer's tax thereon has been paid.

Regulation 17.—Officers or agents of the Department of Agriculture shall make a rigid sanitary inspection of all factories and storehouses where renovated butter is manufactured, packed, or prepared for market. The time of such inspection shall be at the discretion of the Secretary of Agriculture. Full report covering the sanitary conditions shall be made to the Secretary of Agriculture.

Regulation 18.—Inspection shall also be made of the materials going into the manufacture of renovated butter and the product thereof, and the inspector shall report the quantity and quality of renovated butter manufactured and the character and the condition of the materials from which it is made. If materials to be used in the manufacture of renovated butter are deleterious to health or unwholesome in the finished product they shall be confiscated.

Regulation 19.—According to the food and drugs act of June 30, 1906, if renovated butter consists in whole or in part of a filthy, decomposed, or putrid animal or vegetable substance it shall be deemed adulterated under that act.

Regulation 20.—Each manufacturer's package, containing 10 pounds or more solid packed renovated butter, must have branded into the upper surface of the renovated butter the words "Renovated Butter" in one or two lines, the letters to be gothic style not less than one-half inch square and depressed not less than one-eighth of an inch. Prints, bricks, or rolls must be similarly branded, the letters to be not less than three-eighths of an inch square.

Regulation 21.—All coverings or wrappers of prints, bricks, or rolls of renovated butter, whether paper or cloth, must have the words "Renovated Butter" in one or two lines, marked, branded, stenciled, or printed thereon in black or nearly black upon white or light ground, in full-faced gothic letters not less than three-eighths of an inch square, so placed as to be the only marking upon one side or surface of the parcel so packed.

Regulation 22.—Any marks, brands, or labels, other than those mentioned in these regulations, with the exception of the shipping marks used in commerce, must be approved by the Secretary of Agriculture before such marks, brands, or labels may be used by the manufacturers.

Regulation 23.—Copies of all approved marks, brands, or labels must be kept on file and accessible to the officer or agent of the Department of Agriculture at the office or place of business of the manufacturer.

Regulation 24.—While the act of May 9, 1902, does not give the Secretary of Agriculture authority to prescribe regulations for marking or branding other than manufacturers' packages, the food and drugs act of June 30, 1906, prohibits the misbranding of all food articles entering into interstate commerce. An article is misbranded in the following cases:

First. If it be an imitation of or offered for sale under the distinctive name of another article.

Second. If it be labeled or branded so as to deceive or mislead the purchaser.

Third. If in package form, and the contents are stated in terms of weight or measure, they are not plainly and correctly stated on the outside of the package.

Fourth. If the package containing it, or its label, shall bear any statement, design, or device regarding the ingredients or the substances contained therein, which statement, design, or device shall be false or misleading in any particular.

Regulation 25.—Renovated butter for export must be marked and branded as for the domestic market. All renovated butter offered for export must be inspected by duly authorized officers or agents of the Department of Agriculture. After such officer has determined its purity, quality, and grade he shall, if said renovated butter be found pure and properly branded and marked, issue a certificate setting forth these facts.

Regulation 26.—Officers of the Department of Agriculture finding renovated butter on the market not bearing evidence that the tax thereon has been paid, or without the caution notice required, or butter suspected of being renovated or adulterated, will report the facts in the case to the nearest internal revenue officer, and, if necessary, secure samples of the suspected product for transmission to the laboratory of the Internal Revenue Bureau for chemical analysis. Likewise revenue officers, finding renovated butter on the market which does not comply with these regulations, should promptly notify the Department of Agriculture or its nearest representative of the location of such butter and the facts relating thereto.

Regulation 27.—The following directions are given for taking samples of suspected butter:

At least a pound sample should be taken, which should be made up of portions taken from various parts of the package by means of a spoon or trier. This sample should be at once transferred to the container in which it is to be shipped, which must be *watertight and perfectly dry.* All wrappings of any kind must be removed before the sample is placed in the container.

Glass fruit jars with tops that can be screwed down upon rubber rings, or tin fruit cans with tops that can be readily soldered on, are satisfactory and readily obtainable.

The container must be marked so that it can be identified by the officer taking the sample, and it must be accompanied with a full description of the sample as to origin and suspected adulteration, either as a letter of transmittal or with the sample.

The proper sealing and shipping of the sample is of great importance, for if the analyst can not testify that it was received with seals unbroken, the evidence is always open to attack.

The sealing is best accomplished by placing the vessel containing the substance in a box or other suitable receptacle and securing the latter with string or tape in such a manner that the package can not be opened without cutting or untying the tape; the knots and intersections of the latter should then be covered with sealing wax and impressed by means of a broad die bearing letters or characters easily recognized.

The sealing of the bottle or vessel itself is not desirable, as the wax is likely to get into the sample when it is opened. The sealed box may then be inclosed in another box for shipment, if desirable. The method of sealing ordinarily used by express agents will be satisfactory if it is done in the presence of the officer transmitting the sample, and may be applied to the outer box, no other sealing being necessary. This is the most convenient and economical method when a number of samples are transmitted at one time by express.

Samples should be addressed to the Commissioner of Internal Revenue, care of Laboratory, Washington, D. C.

Regulation 28.—The word "adulterated," herein used under the act of May 9, 1902, refers to the definition of the taxable article as given in Regulation 2, while the same word employed in the food and drugs act of June 30, 1906, has reference to the classification under that act.

Regulation 29.—Correspondence and all administrative details under the Regulations numbered 3 to 16, inclusive, above, are assigned to the Commissioner of Internal Revenue, Treasury Department. All matters under Regulations 17 to 26, inclusive, are assigned to the Chief of the Bureau of Animal Industry, Department of Agriculture.

Regulation 30.—These regulations shall become and be effective on and after August 15, 1907.

Approved:

GEO. B. CORTELYOU,
Secretary of the Treasury.
JAMES WILSON,
Secretary of Agriculture.

WASHINGTON, D. C., *July 2, 1907.*

(B. A. I. ORDER NO. 148.)

Special Order Waiving the Tuberculin Test Requirement for Canadian Cattle Imported Temporarily, for Exhibition Purposes, at the Clinton County Agricultural Society Fair, to be Held at Plattsburg, N. Y.

U. S. DEPARTMENT OF AGRICULTURE, BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., July 24, 1907.

Under authority conferred upon the Chief of the Bureau of Animal Industry by Regulation 38 of Bureau of Animal Industry Order No. 142, Regulations for the Inspection and Quarantine of Horses, Cattle, Sheep, and Other Ruminants, and Swine Imported into the United States, the requirements of Regulation 37 of Order No. 142 are hereby waived for cattle to be imported from Canada temporarily, for exhibition purposes, at the Clinton County Agricultural Society Fair, to be held at Plattsburg, N. Y., from September 10 to 14, 1907.

The provisions of said Regulation 38 shall be strictly applied to the cattle covered by this order. Regulation 38 reads as follows:

"*Regulation 38.*—The Chief of the Bureau of Animal Industry may, however, by written order, waive the foregoing tuberculin test requirement for cattle to be imported temporarily for exhibition purposes, provided such cattle are accompanied by a satisfactory certificate of tuberculin test made not more than six months previously and an affidavit by the owner or importer stating that the said certificate of tuberculin test refers to the cattle in question. Any such cattle which are not sold to remain in the United States shall be returned immediately to Canada at the close of the exhibition. The Department must be notified of any Canadian cattle which will remain in the United States, not tested as required by Regulation 37, and the tuberculin test will be applied to them by an inspector of this Department before shipment to destination. All cattle, sheep, and swine intended for exhibition purposes must be shipped directly to the exhibition grounds and must not be unloaded in any public stock yards."

A. D. MELVIN, *Chief, Bureau of Animal Industry.*

(AMENDMENT NO. 1 TO B. A. I. ORDER NO. 136.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Certification of Various Associations.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., July 30, 1907.

The following American association and its affiliated foreign association have this day been certified to the Secretary of the Treasury:

HORSES.

Name of breed.	American book of record.		Foreign book of record.	
	Book of record.	By whom published.	Book of record.	By whom published.
Welsh Pony and Cob.	Welsh Pony and Cob Studbook.	The Welsh Pony and Cob Society of America, John Alexander, secretary, Aurora, Ill.	Welsh Pony and Cob Studbook.	The Welsh Pony and Cob Society, James Hamer, secretary, Greenfield, Penybont, Radnorshire, Wales.

The following foreign association and book of record is certified as being affiliated with the American Leicester Breeders' Association:

SHEEP.

Name of breed.	Book of record.	By whom published.
Leicester sheep.	The Border Leicester Flock Book.	The Society of Border Leicester Sheep Breeders, Robert Wood, secretary, Admiral street, Carnaustie, Scotland.

W. M. HAYS, *Acting Secretary.*

(AMENDMENT NO. 1 TO B. A. I. ORDER NO. 142.)

Amendment to Regulation 35, Providing for the Admission of Horses Belonging to Indian Tribes and Settlers or Immigrants and Those Used in Connection with Stock Raising (Cow Ponies) or Mining, and Those for Temporary Stay at Points along the Frontier not Exceeding Two Weeks (Effective August 15, 1907).

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., July 30, 1907.

Regulation 35 of the Regulations of the Secretary of Agriculture for the Inspection and Quarantine of Horses, Cattle, Sheep, and Other Ruminants, and Swine Imported into the United States, B. A. I. Order No. 142, is hereby amended to read as follows:

"Horses for breeding, racing, show, and sale purposes, for grazing or for work, shall be inspected at the port of entry. Those belonging to Indian tribes and settlers or immigrants and those used in connection with stock raising (cow ponies) or mining, and those for temporary stay at points along the frontier not exceeding two weeks, whether for pleasure, driving, or teaming, shall be required to pass a veterinary inspection at the port of entry by an inspector of the Bureau of Animal Industry; or they may be admitted without inspection upon written permission from the Secretary of Agriculture first had and obtained. *Provided, however,* That neither inspection by an inspector of the Bureau of Animal Industry nor written permission from the Secretary of Agriculture shall be required for Canadian horses for pleasure, driving, or teaming, whether driven or ridden into the United States for a temporary stay of not to exceed three days. The same rule will apply to American horses returning to the United States from Canada after a stay in Canada not to exceed three days. Horses may be admitted in bond at any port of the United States without inspection for export from any port of the United States; they shall, however, be subject to inspection when exported from ports at which this Department has inspectors stationed."

This amendment shall become and be effective on and after August 15, 1907.

W. M. HAYS, *Acting Secretary of Agriculture.*

(AMENDMENT NO. 3 TO B. A. I. ORDER NO. 144.)

Amedment No. 3 to Rule 1, Revision 2.—To Prevent the Spread of Splenetic Fever in Cattle. Amendment Regarding Cattle for Oklahoma State Fair.

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

It is hereby ordered that the provisions of the first paragraph of Exception 4 of Rule 1, Revision 2, dated March 22, 1907, and effective on and after April 15, 1907, be, and the same hereby are, suspended in so far as they may apply to cattle intended for exhibition or sale purposes at the Oklahoma State Fair to be held at Oklahoma City, Okla., October 5 to October 16, 1907.

Provided, That all such cattle, before being shipped, shall be inspected by an inspector of the Bureau of Animal Industry and certified as free from ticks (*Boophilus annulatus*); that they shall be shipped from the point of inspection in clean and disinfected cars;

that they shall be consigned "Care State Fair Association of Oklahoma," and that at destination they shall be subject to such regulations as may be imposed by the Oklahoma Live Stock Sanitary Commission.

Done at Washington this twenty-first day of August, 1907.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] WILLIS L. MOORE, *Acting Secretary of Agriculture.*

(B. A. I. ORDER NO. 149.)

Special Order Waiving the Tuberculin Test Requirement for Canadian Cattle Imported Temporarily, for Exhibition Purposes, at the Michigan State Agricultural Society Fair, to be Held at Detroit, Mich.

U. S. DEPARTMENT OF AGRICULTURE, BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., August 23, 1907.

Under authority conferred upon the Chief of the Bureau of Animal Industry by Regulation 38 of Bureau of Animal Industry Order No. 142, Regulations for the Inspection and Quarantine of Horses, Cattle, Sheep, and Other Ruminants, and Swine Imported into the United States, the requirements of Regulation 37 of Order No. 142 are hereby waived for cattle to be imported from Canada temporarily, for exhibition purposes, at the Michigan State Agricultural Society Fair, to be held at Detroit, Mich., from August 29 to September 6, 1907.

The provisions of said Regulation 38 shall be strictly applied to the cattle covered by this order. Regulation 38 reads as follows:

"*Regulation 38.*—The Chief of the Bureau of Animal Industry may, however, by written order, waive the foregoing tuberculin test requirement for cattle to be imported temporarily for exhibition purposes, provided such cattle are accompanied by a satisfactory certificate of tuberculin test made not more than six months previously and an affidavit by the owner or importer stating that the said certificate of tuberculin test refers to the cattle in question. Any such cattle which are not sold to remain in the United States shall be returned immediately to Canada at the close of the exhibition. The Department must be notified of any Canadian cattle which will remain in the United States, not tested as required by Regulation 37, and the tuberculin test will be applied to them by an inspector of this Department before shipment to destination. All cattle, sheep, and swine intended for exhibition purposes must be shipped directly to the exhibition grounds and must not be unloaded in any public stock yards."

A. D. MELVIN, *Chief, Bureau of Animal Industry.*

(AMENDMENT NO. 1 TO B. A. I. ORDER NO. 143.)

Amending Regulation 24, Regarding Shipment of Cattle Dipped Once or Exposed to Scabies, and Regulation 33, Regarding Proprietary Dips (Effective on and after September 15, 1907).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

It is ordered that Regulations 24 and 33 of the regulations of the Secretary of Agriculture governing the inspection, disinfection, certification, treatment, handling, and method and manner of delivery and shipment of live stock which is the subject of interstate commerce, dated March 22, 1907, and effective on and after April 15, 1907 (B. A. I. Order No. 143), be, and the same are hereby, amended as follows:

Regulation 24.—The first sentence of Regulation 24 is amended by striking out the words "or that have been either dipped once in, or sprayed once with, the petroleum or oil emulsion."

Regulation 33.—That part of Regulation 33 specifying the points to be agreed to by the manufacturer of a proprietary substance before it will be approved for use in official dipping is amended to read as follows:

(1) To recommend for sheep scab a dilution of the product, so as to conform to the requirements of the Department of Agriculture.

(2) To maintain said product at a uniform composition.

(3) To place on packages of dips which have been examined and found to conform to the requirements of the Department the following statement:

A sample of this product has been submitted to the United States Department of Agriculture for examination. We guarantee the contents of this package to be of the same composition as the sample submitted to the Department, and that when diluted according to the directions printed thereon for the treatment of sheep scab it will give a dipping fluid of the composition required of a _____ [a] dip by the regulations of the Secretary of Agriculture governing sheep scab.

(4) To have on containers or advertising matter no reference to the United States Government or any of its Departments except as provided in the preceding paragraph, unless such reference has been submitted to and approved by the Department of Agriculture, and to have on containers or advertising matter no false or misleading statement.

Done at Washington this twenty-third day of August, 1907.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] WILLIS L. MOORE, *Acting Secretary of Agriculture.*

Meat Inspection Rulings—2 A.

DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., September 2, 1907.

The following rulings under the meat inspection law and the regulations made thereunder are announced by the Department of Agriculture:

COLORS.

Regulation 39, as amended by Amendment No. 6 to B. A. I. Order No. 137, provides that no dye, unless authorized by Federal statute, shall be used in any meat food product prepared for interstate or foreign commerce until the use of such dye has been specifically authorized by the Secretary of Agriculture. It has been decided to allow the use of certain dyes on sausage and other casings when the character of the casing is such that the dye will not penetrate into the meat food product contained in the casing. Cloth casings which it is desired to color with these dyes shall first be dipped in uncolored paraffin. Heretofore permission has been granted for the use of annatto for this purpose. In addition the dyes permitted under the food and drugs act of June 30, 1906, as enumerated in Food Inspection Decision 76, may be used for dyeing casings but for no other purpose.

These dyes are as follows:

Red shades:
107. Amaranth.
56. Ponceau 3 R.
517. Erythrosin.

Orange shades:
85. Orange 1.

Yellow shades:
4. Naphthol yellow S.

Green shades:
435. Light green S. F. yellowish.

Blue shades:
692. Indigo disulfo acid.

The numbers preceding the names refer to the number of the dye in question as listed in A. G. Green's edition of the Schultz-Julius Systematic Survey of the Organic Coloring Matters, published in 1904.

MARKING PRIMAL PARTS.

Regulation 29 provides that when primal parts or organs are shipped between establishments at which inspection is maintained the number of the establishment need not appear. This practice will not prevail hereafter. When primal parts or organs are shipped between establishments the inspection legend, or an authorized abbreviation thereof, including the number of the establishment in which the primal part or organ originated, shall be placed thereon, except where shipments are made in sealed cars under Regulation 54, in which case the meat is not required to be marked with the inspection legend. When the primal part or organ is processed or treated in any manner in another establishment the number of this second establishment treating the part or

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[a] There should be inserted here the name of the *class* of dips to which the product belongs, such as "cresol" or "lime and sulphur," etc.

organ shall be placed immediately below or following the original inspection legend. For example, a primal part which originated in establishment No. 5 and which was afterward processed in establishment No. 218 should bear the following marks:

U. S. Insp'd
5
& Passed
218

These rulings will become effective at once.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 1 TO B. A. I. ORDER NO. 146.)

Amendment No. 1 to Rule 3, Revision 1.—To Prevent the Spread of Scabies in Sheep (Amendment Effective on and after October 15, 1907).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The fact has been determined by the Secretary of Agriculture, and notice is hereby given, that the contagious and communicable disease known as scabies is not now known to exist, or exists to a slight extent only, among sheep in the States of Idaho and Wyoming, quarantined by Rule 3, Revision 1, dated March 22, 1907, and effective April 15, 1907.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, do hereby remove and revoke the quarantine placed by Rule 3, Revision 1, upon the following area, to wit:

The States of Idaho and Wyoming.

Done at Washington this twenty-sixth day of September, 1907.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] JAMES WILSON, *Secretary of Agriculture.*

Notice Regarding Interstate Movement of Horses, Mules, and Asses Affected With Glanders.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., October 9, 1907.

The attention of managers and agents of railroads and transportation companies, of stockmen and others interested in the interstate movement of horses, mules, and asses, is directed to the provisions of section 6 of the act of Congress approved May 29, 1884, entitled "An act for the establishment of a Bureau of Animal Industry," etc. This section reads in part as follows:

"SEC. 6. That no railroad company within the United States, or the owners or masters of any steam or sailing or other vessel or boat, shall receive for transportation, or transport from one State or Territory to another, or from any State into the District of Columbia, or from the District into any State, *any live stock affected with any contagious, infectious, or communicable disease,* and especially the disease known as pleuro-pneumonia; nor shall any person, company, or corporation deliver for such transportation to any railroad company, or master or owner of any boat or vessel, any live stock, knowing them to be affected with any contagious, infectious, or communicable disease; nor shall any person, company, or corporation drive on foot or transport in private conveyance from one State or Territory to another, or from any State into the District of Columbia, or from the District into any State, any live stock, knowing them to be affected with any contagious, infectious, or communicable disease, and especially the disease known as pleuro-pneumonia." (23 Stat. L., 32.)

Under this section it is a misdemeanor, punishable by fine and imprisonment, for any person or corporation to deliver for transportation, receive for transportation, transport, drive on foot, or otherwise remove from one State or Territory or the District of Columbia into another State or Territory or District of Columbia any horses, mules, or asses which are affected with glanders, as disclosed by a physical examination or by the mallein test.

It is suggested that common carriers engaged in such interstate transportation require the shipper of such animals in all cases to sign a statement to the effect that the animals offered for shipment are not affected with glanders.

JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT NO. 4 TO B. A. I. ORDER NO. 144.)

Amendment No. 4 to Rule 1, Revision 2.—To Prevent the Spread of Splenetic Fever in Cattle (Effective on and after November 1, 1907).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The provisions of Rule 1, Revision 2, to prevent the spread of splenetic fever in cattle, effective on and after April 15, 1907, are hereby amended by the addition of the following exception, which shall become and be effective on and after November 1, 1907:

Exception 12—Louisiana.—No cattle shall be moved or allowed to move from the modified quarantined area of any State or Territory, other than Louisiana, into the parishes of Lincoln and Claiborne in the State of Louisiana unless and until such cattle have been dipped or sprayed in Beaumont crude petroleum or an emulsion thereof, or otherwise satisfactorily treated, under the supervision of an inspector of the Bureau of Animal Industry.

Done at Washington this tenth day of October, 1907.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT NO. 5 TO B. A. I. ORDER NO. 144.)

Amendment No. 5 to Rule 1, Revision 2, to Prevent the Spread of Splenetic Fever in Cattle.—Revoking Exception 9 and Modifying Exception 11. (Effective on and after November 15, 1907.)

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

It is ordered that Rule 1, Revision 2, to prevent the spread of splenetic fever in cattle, effective on and after April 15, 1907, be, and the same is hereby, amended. This amendment, which will be effective on and after November 15, 1907, is designated as amendment No. 5 to B. A. I. Order No. 144, and is as follows, to wit:

Exception 9.—Exception 9 is revoked.

Exception 11—Open Season.—During the months of January, November, and December of each year cattle of the modified quarantined area of any State or Territory may be moved interstate therefrom for purposes other than immediate slaughter into the State of Kansas, the Territories of Arizona and New Mexico, those portions of the States of California, Texas, Tennessee, and Georgia not included in the modified quarantined area, and that portion of the State of Missouri south of the Missouri River if the said cattle shall first have been inspected under proper facilities for inspection at the point of origin and found free of infection and a written permit for the movement issued by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the State or Territory to which the cattle are destined, and if permission shall first have been obtained from the proper official of the said State or Territory. During the months of January and February, the first fifteen days of March, and the last sixteen days of December in each year cattle of the modified quarantined area of any State or Territory may be moved interstate therefrom for purposes other than immediate slaughter under the above-mentioned restrictions into those portions of the States of Virginia and North Carolina not included in the modified quarantined area. During the month of January and the last seventeen days of December in each year, cattle of the modified quarantined area of any State or Territory may be moved interstate therefrom for purposes other than immediate slaughter under the above-mentioned restrictions into that portion of the Territory of Oklahoma not included in the modified quarantined area.

Cattle of the modified quarantined area that have been shipped interstate during the months of January, November, and December of each year to any State or Territory outside of the modified quarantined area other than those States and Territories and portions thereof set out in this exception shall not be moved into any of the States or Territories or portions thereof hereinbefore set out in this exception within three months of the date of the movement from the modified quarantined area.

Cattle which are moved interstate from the modified quarantined area of any State or Territory into those States or Territories or portions thereof hereinbefore set out in this exception, under certificates from inspectors either of the Bureau of Animal Industry or of the States or Territories to which the cattle are destined for feeding or stocking pur-

poses shall, when shipped, be transported in cleaned and disinfected cars or boats, and shall not be placed in stock pens which have been reserved for cattle originating in the modified quarantined area.

Done at Washington this thirty-first day of October, 1907.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT NO. 2 TO B. A. I. ORDER NO. 143.)

Amendment No. 2 to B. A. I. Order No. 143.—Modification of Regulations 13 and 14, Relating to the Prevention of the Spread of Splenetic Fever of Cattle (Effective on and after November 15, 1907).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The Regulations of the Secretary of Agriculture governing the inspection, disinfection, certification, treatment, handling, and method and manner of delivery and shipment of live stock which is the subject of interstate commerce, issued under date of March 22, 1907, effective on and after April 15, 1907, are hereby modified by the revocation of Regulations 13 and 14 and the substitution therefor of the following regulations, which revocation shall take effect on November 15, 1907, on and after which date the regulations given below shall become and be effective until otherwise ordered.

Regulation 13.—Cattle of the modified quarantined area of any State or Territory shall not at any time be transported, driven, or allowed to drift therefrom to any portion of the modified quarantined area of any other State or Territory to which the intrastate movement of cattle of the modified quarantined area is prohibited by the State or Territorial authorities thereof.

Regulation 14.—Interstate shipments of cattle from the modified quarantined area may be made at any time, by rail or boat, to recognized slaughtering centers for immediate slaughter, but cattle shall not be trailed or driven or hauled in private conveyances from the modified quarantined area in any State or Territory to any point in any other State or Territory not included in the modified quarantined area.

Interstate shipments of cattle from the modified quarantined area may be made during the months of January, November, and December of each year by rail or boat for any purpose into the District of Columbia, the States of Colorado, Connecticut, Delaware, Idaho, Illinois, Indiana, Iowa, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New York, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Utah, Vermont, Washington, West Virginia, Wisconsin, and Wyoming, and that portion of the State of Missouri north of the Missouri River, under such restrictions as may be imposed by officials of the State or Territory or the District of Columbia at destination.

When cattle are transported under the provisions of this regulation, the following rules regarding their movement shall be observed:

(*a*) Cattle of the modified quarantined area which in course of interstate transportation therefrom are unloaded at a point not within the modified quarantined area to be fed or watered, or for other purposes, shall be placed in pens or yards reserved for cattle of the modified quarantined area. Such pens and yards shall be separated from the pens and yards used for cattle that are not of the modified quarantined area as hereinafter provided, and shall be marked with a conspicuous sign bearing the words "QUARANTINE PENS" or "QUARANTINE YARDS," in letters not less than 10 inches in height. If cattle not of the modified quarantined area shall be placed in the said pens or yards, such cattle shall thereafter be treated in all respects as if they were actually of the modified quarantined area. At points of destination, chutes and alleyways and pens, maintained as hereinafter provided and marked with a sign, as hereinbefore specified, shall be set apart to receive cattle of the modified quarantined area, and no other cattle shall be admitted to said chutes, pens, and alleyways. The regulations relating to the movement of cattle of the modified quarantined area as prescribed by the proper State officers at destination shall be carefully observed.

(*b*) The cars or boats which have carried cattle of the modified quarantined area shall be cleaned and disinfected as hereinafter provided as soon as possible after unloading and before the said cars or boats are again used in the interstate transportation of live stock or merchandise.

(*c*) Where cattle of the modified quarantined area in course of interstate transportation and cattle not of the modified quarantined area are yarded in adjacent pens, there shall be a space not less than 10 feet wide between the pens, which space shall not be occupied by cattle, and there shall be on each side of this space a tight board fence not less than 5 feet high: *Provided,* That the pens used for cattle of the modified quarantined area shall be inclosed by a tight board fence not less than 6 feet high on the inside.

If for any reason, such as delays or wrecks, it is necessary to unload cattle of the modified quarantined area which are being transported as "Southern Cattle" into pens or yards which have not been specially provided for that purpose as hereinbefore indicated, the transportation company shall immediately forward notice of such unloading and the reasons therefor to the Chief of the Bureau of Animal Industry, at Washington, D. C.

(*d*) The proper officers of the transportation companies shall securely affix to both sides of all cars carrying interstate shipments of cattle from the modified quarantined area, except as hereinafter provided, durable placards not less than 5½ by 8 inches in size, on which shall be printed with permanent black ink and in boldface letters not less than 1½ inches in height the words "SOUTHERN CATTLE." These placards shall also show the name of the place from which the shipment was made, the date of the shipment (which must correspond with the date of the waybills and other papers), the name of the transportation company, and the name of the place of destination. Each of the waybills, conductors' manifests, memoranda, and bills of lading pertaining to such shipments by cars or boats shall have the words "SOUTHERN CATTLE" plainly written or stamped upon its face. Whenever such shipments are transferred to another transportation company or into other cars or boats, or are rebilled or reconsigned from any point outside of the modified quarantined area to a point other than the original destination, the cars into which said cattle are transferred and the new waybills, conductors' manifests, memoranda, and bills of lading covering said shipments by cars or boats shall be marked as herein specified for cars carrying said cattle from the modified quarantined area, and for the billing, etc., covering the same. If for any reason the placards required by this regulation are removed from the car or are destroyed or rendered illegible they shall be immediately replaced by the transportation company or its agents, the intention being that legible placards shall be maintained on the car from the time such shipments leave the modified quarantined area until they arrive at destination.

(*e*) No car or boat containing an interstate shipment of cattle of the modified quarantined area shall receive on board cattle which are not of the modified quarantined area. Interstate shipments of cattle of the modified quarantined area shall not be made to points outside of said modified quarantined area where proper facilities have not been provided for transferring the said cattle from the cars or landing to the stock yards and slaughterhouses without passing them over public highways, unless permission for such passing is first had and obtained from the proper authorities at point of destination.

(*f*) The cars and boats used for the interstate transportation of cattle of the modified quarantined area, and also the chutes, alleyways, and pens not reserved for the exclusive use of such cattle used en route and at points of destination, shall be disinfected in the following manner: Remove all litter and manure. This litter and manure may be disinfected by mixing it with lime or saturating it with a 5 per cent solution of pure carbolic acid; or, if not disinfected, it shall be stored where no cattle can come in contact with it during the period from February 1 to October 31, inclusive, of each year. Wash the cars and the watering and feeding troughs with water until clean. Saturate the entire surface of the cars, including the inner surface of the car doors, and the fencing, troughs, chutes, and floors of the pens with a mixture made of 1½ pounds of lime and one-fourth pound of pure carbolic acid to each gallon of water, or with a solution made by dissolving 4 ounces of chlorid of lime to each gallon of water.

(*g*) Cars which have carried cattle within the modified quarantined area of any State or Territory shall be cleaned and disinfected before being taken to any point in another State or Territory not in the modified quarantined area. This provision shall not apply to cars containing cattle in the course of interstate transportation for immediate slaughter, in accordance with these regulations.

Done at Washington this thirty-first day of October, 1907.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.] JAMES WILSON, *Secretary of Agriculture.*

Notice Regarding the Interstate Movement of Cattle and Swine which are Affected with Tuberculosis.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., November 6, 1907.

The attention of managers and agents of railroads and transportation companies, of stockmen, and others interested in the interstate movement of cattle and swine is directed to the provisions of section 6 of the act of Congress approved May 29, 1884, entitled "An act for the establishment of a Bureau of Animal Industry," etc. This section reads in part as follows:

"SEC. 6. That no railroad company within the United States, or the owners or masters of any steam or sailing or other vessel or boat, shall receive for transportation or transport, from one State or Territory to another, or from any State into the District of Columbia, or from the District into any State, *any live stock affected with any contagious, infectious, or communicable disease,* and especially the disease known as pleuro-pneumonia; nor shall any person, company, or corporation deliver for such transportation to any railroad company, or master or owner of any boat or vessel, any live stock, knowing them to be affected with any contagious, infectious, or communicable disease; nor shall any person, company, or corporation drive on foot or transport in private conveyance from one State or Territory to another, or from any State into the District of Columbia, or from the District into any State, any live stock, knowing them to be affected with any contagious, infectious, or communicable disease, and especially the disease known as pleuro-pneumonia." (23 Stat. L., 32.)

Under this section it is a misdemeanor, punishable by fine and imprisonment, for any person or corporation to deliver for transportation, receive for transportation, transport, drive on foot, or otherwise remove from one State or Territory or District of Columbia into another State or Territory or the District of Columbia any cattle or swine which are affected with tuberculosis, as disclosed by a physical examination or by the tuberculin test, or by any other means.

In cases where evidence is furnished the Department that any person, firm, or corporation has transported, driven on foot, or otherwise removed from one State or Territory or the District of Columbia into another State or Territory or the District of Columbia any cattle or swine which are affected with tuberculosis, knowing from a physical examination or from the tuberculin test, or by any other means, that such animals are affected with tuberculosis, vigorous prosecution will be had in the Federal courts under section 6 of the act of May 28, 1884, *supra.*

JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT NO. 2 TO B. A. I. ORDER NO. 142.)

Amendment to Regulation 1, Designating East Alburg, Vermont, as a Quarantine Station.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., November 19, 1907.

Regulation 1 of the Regulations of the Secretary of Agriculture for the Inspection and Quarantine of Horses, Cattle, Sheep, and Other Ruminants, and Swine Imported into the United States, B. A. I. Order No. 142, is hereby amended to include East Alburg, Vt., as a port of entry for animals which are subject to both inspection and quarantine.

This amendment shall become and be effective on and after December 1, 1907.

JAMES WILSON, *Secretary of Agriculture.*

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